CONTRIBUTIONS TO ECONOMICS

Eveline van Leeuwen

Urban-Rural Interactions

Towns as Focus Points in Rural Development

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Towns as Focus Points in Rural Development

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Introduction

1.1 Small and Medium-Sized Towns

In terms of land area, modern Europe (EU-25) is 90% rural (European Communities 2006). The rural areas are quite diverse not only geographically and in terms of landscape but also in terms of the different challenges they face. However, the shift from agricultural production towards a multifunctional landscape and the increasing value assigned to environmental values affects all rural areas. According to the OECD, today, even in the predominantly rural regions, agriculture contributes less than 15% to the total production and income generated (OECD 2002).

Much research has been undertaken on both urban issues and rural areas, but the number of recent studies dealing with small or medium-sized towns (5,000–20,000 inhabitants) is limited.[1] In a way this is strange, because towns also have many of the advantages that cities have, and they are also strongly connected to their surrounding areas. Towns used to have a symbiotic relationship with their surrounding area, acting as a source of firm and farm inputs (both goods and services), as a first destination for farm outputs, as a provider of (supplementary) employment and income to households, and as a source of consumer goods and services for households (Tacoli 1998). Over the years, this symbiosis has certainly changed, but towns could still be considered as important tools in rural development, not only in peripheral areas but also in the vicinity of cities. Towns are locations where rural activities meet and where (often) organizational advantages are found. If something needs to be changed in rural areas, then towns could be a place to start.

In this study, we will focus on the current function of towns in the regional economy in Europe in general and in the Netherlands more specifically. We will try to find out how important the local economy is for households, farms and firms in small and medium-sized towns and in which way.

[1] Exceptions are a number of studies dealing with town issues in the UK, e.g. Thomas and Bromley 1995; Powe and Shaw 2004; Findlay and Sparks 2008). However, studies about such towns in other European countries are rarely found.

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1.2 Recent Developments

Modern Europe has rural roots. As mentioned, even today, as much as 90% of Europe (EU25) consists of rural areas in which half of the population lives. The different challenges that rural areas face range from restructuring the agricultural sector, remoteness, poor service provision, and depopulation to population influx and pressure on the natural environment, particularly in the rural areas close to urban centres. Recently, climate change can also be added as a challenge. Problems caused by climate change will predominate in the southern areas of Europe. The potential increase in water shortage and extreme weather conditions may cause lower harvestable yields, higher yield variability, and a reduction in suitable areas for traditional crops (Olesen et al. 2008). In northern areas, on the other hand, climate change may produce positive effects on agriculture through the introduction of new crop species and varieties, higher crop production, and the expansion of suitable areas for crop cultivation.

A wide range of other developments are taking place both in cities and in the countryside. On the one hand, there is a decline of facilities in rural areas. In particular, in certain remote places in France, but also in regions in England or the Netherlands, smaller shops often have to close down because they can not compete with large (inter)national chains. Although this also happens in larger cities, the consequences in rural areas have a stronger societal impact, particularly in remote areas where the distance to the next shop can be considerable. On the other hand, technological developments, such as the Internet, increasingly enable rural households (as well as rural firms) to order and sell a wide range of products from home, in a very efficient and simple way. In the Netherlands, it appears that particularly households and small firms in rural areas are selling their products on 'Marktplaats', an E-bay-like trading-website (Havermans 2007). Besides scale enlargement in the retail sector, health and education services are also scaling up. Again, this is taking place in both city and countryside, but it has a negative effect particularly on vulnerable groups, such as children and the elderly in rural areas.

Nevertheless, in cities as well, certain developments can have a strong (negative) impact. One example is that cities are becoming less attractive locations for households and firms. Congestion and a decreasing quality of life in cities make rural areas (relatively) more attractive. Broersma and van Dijk (2008) found that the negative (economic) effect of congestion dominates the positive agglomeration effect of cities, particularly in the core regions of the Netherlands. Furthermore, according to Heins (2004), nearly 90% of the Dutch urban residents who are planning to move would like to go to a residential environment with rural characteristics.[2] This results in a tension between demand and supply where rural living is concerned, especially in the western part of the country (Ministry of

[2]However, to urbanites, rural living does not necessarily mean living in a completely rural area; half of them would like to move either to the real countryside or to a residential environment in the urban zone with rural characteristics.

Housing 2000). This 'counter-urbanization' is encouraged by an increasing level of mobility (Champion 1998); over the last 20 years, the average distance between place of residence and place of work has increased by almost 60% (Statistics Netherlands 2008). Nowadays, it is easier for households to work in a city but live in a pleasant town.

However, this increasing demand for rural living is not occurring in all countries. Berry and Okulicz-Kozaryn (2009) found that among the wealthier countries of the world it is those of Anglo-Saxon heritage that display a strong level of satisfaction with rural living and dissatisfaction with big-city residence. On the other hand, European countries of Latin heritage display no preference for either rural or urban living.

1.3 Countryside Policies and Towns

1.3.1 European Countryside Policies

EU policies, concerning rural areas and the agricultural sector have changed considerably over the last 40 years. After the Second World War, it was considered important to increase the output of the agricultural sector to ensure the availability of enough food to avoid shortages. Emphasis was put on the modernization of the agricultural sector and the restructuring of rural areas. This resulted in severe damage to the rural environment and landscape. Recently, the focus has shifted from the production of agricultural products to a focus on the development of rural areas in general. The recent reforms of the Common Agricultural Policy (CAP) introduced the decoupling of subsidies from production, the possibility to reduce direct payments to the farmer if sustainability standards are not respected (cross-compliance), and the transfer of funds (modulation) from the 1st to the 2nd pillar.[3] This includes the recognition of the multifunctionality of agriculture (not only producing food) and a multi-sectoral and integrated approach to the rural economy in order not only to diversify activities and create new sources of income and employment but also to conserve the rural heritage and landscape. The EU's Rural Development Policy 2007–2013 focuses on four main themes: increasing the competitiveness of farming and forestry; protecting the environment and countryside; improving the quality of life; and the diversification of the rural economy. In order to obtain EU support, all Member States have had to prepare a Rural Development Programme (RDP), setting out those measures that they intend to implement in the period 2007–2013. The four themes are complemented by a 'methodological' approach, the LEADER approach. The LEADER programme

[3]The 1st pillar concentrates on providing basic income support to farmers, who are free to produce in response to market demand, while the 2nd pillar supports agriculture, as a provider of public goods, in its environmental and rural functions, and rural areas in their development (European Communities 2006).

aims to foster economic development in rural areas by utilizing a partnership approach. It operates via geographically-based Local Action Groups, consisting of representatives of the appropriate local authorities, other development agencies, and community groups (European Communities 2006). For this LEADER approach, towns are of great importance.

1.3.2 Towns in National Countryside Policies

Only in a few countries are towns explicitly mentioned as important tools in rural development. However, implicitly, their value is apparent. In France, spatial planning policy strives to forge links between town and country. The French Government claims that it is aware of the critical role that medium-sized towns (urban areas with a population of 30,000–200,000) play as an interface between the metropolises and rural areas and as centres for jobs and services (Ministère des Affaires Étrangères 2006).

As in the other new Member States, in Poland the agricultural sector is still relatively important. Nevertheless, the income of rural households mainly consists of early retirement payments, pensions, and social security. Furthermore, there is a surplus of rural workers, particularly because of modernization processes in the agricultural sector. In this regard, the issue of seeking alternative sources of income is very important. Therefore, the relatively dense network of towns is seen as a great advantage to solve many of the problems faced by the Polish rural areas and to encourage economic development (Hadyńska and Hadyński 2006).

In a densely populated country such as the Netherlands, for many years strong national planning controls have sought to contain economic activity and housing within towns in order to protect the surrounding countryside. In the most recent rural policy document, the 'Agenda for a Living Countryside' (Ministry of Agriculture, Nature and Food Quality 2004), it is accepted that, although agriculture still dominates land use and the identity of the Dutch landscape, in many regions it no longer provides the main economic base. Therefore, the importance of introducing new economic activities in rural areas is acknowledged, and the development of new firms and new houses can be more frequently allowed in towns and rural areas. Furthermore, concerning the quality of life and the decreasing level of facilities in towns, the government aims to encourage local initiatives by both municipalities and residents to preserve social linkages and amenities.[4]

[4]Interestingly, to a certain extent, this approach seems to work. Around 2004, the first initiatives began to take effect and maintain a certain level of facilities in small towns by developing '*Hart* shops' or 'Service shops'. In many regions the provincial government subsidizes local initiatives to develop shops in which both commercial and public services are offered at the same location, in order to keep a basic level of facilities (Lieshout 2005). An example is a small town near Deventer called Lettele, where the municipality of Deventer opened a service point in an existing shop, and, recently, the library also started to lend books from this location. Nevertheless, the government is (still) responsible for social care, cultural facilities, and libraries.

Only in the UK are small and medium-sized towns – known as 'market towns' – seen as key-elements in rural development which contribute significantly to prosperity in the rural areas around them as described in the Government' Rural White Paper Our Countryside: The Future - A Fair Deal for Rural England (DEFRA 2000). These towns are considered particularly important in providing employment, services and social activities for their own inhabitants and the inhabitants of their hinterland. However, in more recent documents, it is recognized that is it not efficient to have general policies regarding market towns, but it is important that initiatives to enhance social and economic prosperity are tailored to the particular needs of the region and local people (DEFRA 2004).

1.3.3 Economic Diversity

The increasing focus of policies on a multifunctional agricultural and a diverse rural economy often seems to lack any support from empirics. Since the reform process began, the term 'multifunctionality' has been often used, and even provides support for non-agricultural activities (Râmniceanua and Ackrill 2007). The most common definition of multifunctionality derives from the idea of the joint production of commodity and non-commodity outputs. However, implicit in the debate is the distinction between agricultural multifunctionality (tourism at the farm) and rural multifunctionality (Rodríguez Rodríguez et al. 2004).

The regional literature offers the hypothesis that more industrially diverse areas should experience more stable economic growth and less unemployment than less diverse areas. However, diversity is not simply the absence of specialization. Moreover the direction of the relationship between diversity and performance is not always very clear. Specialization and diversity both have a positive effect on new firm formation, as well as on the growth of incumbent firms (Van Oort 2007). On the one hand, Gleaser et al. (1992) find that employment growth and firm dynamics are enhanced by a diversity of economic activities. On the other hand Black and Henderson (1999) and Beardsell and Henderson (1999) find employment growth is faster when most firms concentrate within one sector (specialization).

However, different spatial and economic circumstances can call for the economic diversification of rural areas. In EU and national policies, a clear tendency to increase agricultural and rural multifunctionality can be seen. The question, however, is: To what extent does economic diversification positively affects economic performance of rural regions?

1.3.4 Importance of Towns

Taking into account the significant changes and challenges in rural areas and the economic and organizational advantages of towns, it can be expected that towns will become increasingly important for (inter)national policy makers,

especially in relation to the decentralization of rural policies. First of all, the changes in the agricultural sector and the intended increasing diversity of other economic activities in rural areas requires a wide range of facilities to be offered by small and medium-sized towns. Not only the presence of shops or commercial services but also public services are necessary to new firms. In addition, the availability of certain facilities for households will increase the attractiveness of towns as a place to live for new employees, which will decrease commuting distances.

Secondly, the EU-Leader approach, as well as many national rural programmes (for example, the Dutch one) hands over a great deal of responsibility to local actor groups. In the literature, this is referred to as the 'endogenous rural development approach'. This is an approach that seeks to regenerate rural areas by enhancing and adding value to local resources, both physical and human, according to the priorities and preferences of the local community (van der Ploeg and van Dijk 1995). A disadvantage of this approach is that not all rural localities (both municipalities and other local actors) are equally able to regenerate themselves through the enhancement of their endogenous resources or are equally equipped to compete successfully for external funding and support. Ultimately, however, this can lead to uneven rural development (Woods 2006; and see also Ray 2006).

In our opinion, the ambition to develop a more diversified rural economy, as well as the bottom-up approach and local focus of many rural policies, requires a clear knowledge of the current socio-economic function of towns and town-hinterland linkages.

1.4 Aim and Set-Up

1.4.1 Research Questions

The aim of this study is to contribute to the understanding of the contemporary function of towns in the regional economy and their potential in rural development: How important are small and medium-sized towns to local households and firms? And, how strong are town-hinterland interactions these days? Apart from showing a general picture of urban-rural interactions, we will focus more specifically on households, farms and firms.

This book aims to answer the following research questions:

– Can small-and medium-sized towns still be considered as concentration points of economic activities for town and hinterland actors? And should they be the focus point in rural development?

In relation to households we will focus on how important town and hinterland are for shopping, working, and living. Furthermore, we are interested in how the

spatial characteristics of town and hinterland affect the behaviour of households, in particular their shopping behaviour. Finally, there will be a focus on the importance of different groups of households to the local economy,[5] as well as on the effects of future demographic developments on the (total) expenditures of local households.

In relation to firms and farms we will look at how important local networks are compared with total networks to firms and farms, i.e. how important are town and hinterland for local business? In addition, we will address which sectors can be indicated as key-sectors in the town and hinterland economy. And finally the focus will be on future developments that affect the output of the retail sector in small and medium-sized towns.

1.4.2 Set-Up

In this book, the multifaceted relationships between town-hinterland and the regional economy will be explored at different spatial levels and for different actors, in particular for households, farms and firms.

First, in Chap. 2, we describe the theoretical aspects of town and hinterland interactions found in the literature. In addition, a conceptual framework of town-hinterland functions will be presented. Chapter 3 examines the multifunctionality of towns for local households. It shows, for local households in five different countries, how important town and hinterland are for shopping, working and living. Furthermore, using regression analysis and a multinomial logit model, this chapter points out important factors affecting the spatial shopping behaviour of households. In Chap. 4 emphasis is put on farms and their integration into the local economy. A comparison is made between firms and farms of equal size in terms of employment. Furthermore, important factors affecting the choice for off-farm employment will be analyzed using a tobit model.

Next, in Chap. 5, we provide an overview of the total (macro)economic structure of town and hinterland. Social accounting matrices (SAM), for each of the 30 European towns, are used to estimate the role of local firm networks in the total input and output networks of firms located in town or hinterland. In addition, a SAM multiplier analysis shows the macroeconomic effects of hypothetical shocks on final demand or household income.

Then, in Chap. 6, the emphasis is put on households. In this chapter, a spatial microsimulation model for rural households is developed, called SIMtown. This model simulates the total population of Nunspeet and Oudewater (two Dutch towns), including a large number of household characteristics, several of which are relevant to predict the shopping behaviour. These micro-populations are very useful to estimate the effects of different kinds of retail development in Chap. 7. In the second part of Chap. 6, the simulated micro-populations are used to analyse

[5]The local economy is defined as that of town and hinterland together.

data on the characteristics of households. Such data were previously not available. Then, Chap. 7 combines the micro-approach used in Chaps. 3 and 6 with the macro-approach from Chap. 4 in order to analyse the effects of future developments. First, the effects of population dynamics (in 2010 and 2020) on total local expenditures are simulated, using SIMtown. Secondly, the effects of new retail developments, such as a new shopping mall at the edge of a town, are derived, using the simulated population of 2010 and a multinomial logit model. By combining the effects of these developments with SAM retail multipliers, macroeconomic effects can be derived as well. Finally, in Chap. 8, conclusions and policy lessons are drawn.

1.5 Data Set and Spatial Set-Up

For a large part of the analyses in this book, data derived from the European Union research project 'Marketowns'[6] was used. The Marketowns project, which finished in 2004, focused on the role of small and medium-sized towns as growth poles in regional economic development. For this purpose, the flow of goods, services and labour between firms and households in a sample of 30 small and medium-sized towns in five EU countries was measured. The participating countries reflect the varied conditions of the both existing and the enlarged European Union, viz. France, Poland, Portugal, the Netherlands, and the UK (for a list of all towns, see Appendix A1.1).

Table 1.1 shows the different situations in these five countries: for example, the high population density in the Netherlands, the relatively low GDP per capita in Poland and Portugal, the large share of agriculture in total employment in these same countries, and the large farm sizes in the United Kingdom and France.

In each of the five participating countries, information on small and medium-sized towns was collected with reference to a set of relevant, predefined criteria, e.g. that no other town with more than 3,000 inhabitants should be located in a hinterland with a radius of approximately 7 km from the centre of each town. Small towns were defined as towns with a population of between 5,000 and 10,000 inhabitants, and medium-sized towns as towns with a population of between 15,000 and 20,000 inhabitants. To reflect the different range of circumstances and contexts across rural Europe, in each country two towns[7] for each type of area were selected: *agricultural* areas, i.e. where employment in agriculture is well above the national

[6]Marketowns project funded by the European Commission under the Fifth Framework Programme for Research and Technology Development, Contract QLRT -2000-01923. The project involves the collaboration of The University of Reading (UK), the University of Plymouth (UK), the Joint Research Unit INRA-ENESAD (France), the Agricultural Economics Research Institute LEI (The Netherlands), Polish Academy of Sciences (Poland) and the University of Trás-os-Montes e Alto Douro (Portugal).

[7]One small and one medium-sized town.

Table 1.1 Information concerning socio-economic and agricultural characteristics of the five EU countries under study

	UK	France	Netherlands	Poland	Portugal
Population, 2005 (*1,000,000)	60	61	16	38	11
Population density, 2003 (inh./km^2)	244	112	480	122	114
GDP/capita, 2005 (PPS)	27,000	25,500	28,900	11,600	16,600
Share of agriculture in total employment, 2002 (%)	3	4	3	18	10
Share of agricultural area in total land area, 2003 (%)	70	57	57	53	43
Average farm size, 2005 (ha)	81	52	24	12	16
Number of farms, 2005 (*1,000)	183	545	82	1083	219

Source: EEAC/RLG/WUR 2007

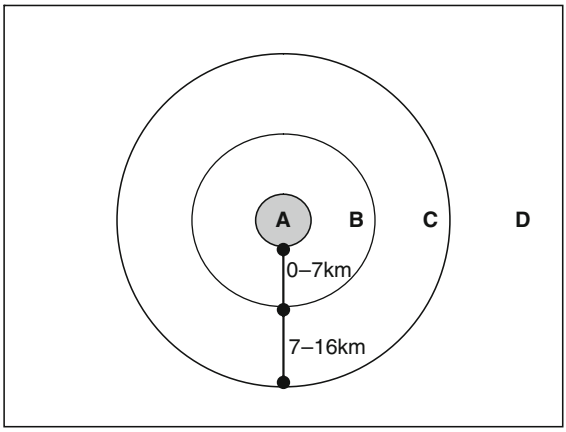

Fig. 1.1 Defined research zones around each town

average; *tourism* areas, i.e. where employment in tourism is well above the national average; and accessible *peri-urban* areas, i.e. those within daily commuting distance of a metropolitan centre.

To facilitate the analysis of economic linkages of firms and households in a town, several zones around each town were distinguished (see Fig. 1.1). In this study, we distinguish four zones[8]: The town-centre itself is classified as zone A; the area within a radius of 7 km around the town centre as zone B (the hinterland of the town centre); the area within a radius of 7–16 km around the town-centre as zone C; and the rest of the world (ROW) as zone D.

[8]In the Marketowns study, seven zones are distinguished (town, direct hinterland, extended hinterland, rest of the region, rest of the country, rest of Europe and rest of the world. However, in this study the main focus is on the local economy, thus allowing the aggregation of the last four zones into one 'rest of the world' zone.

Table 1.2 Total number of questionnaires collected per actor per country (2002–2003)

	England	France	Netherlands	Poland[a]	Portugal[a]	Total
Firms	505	494	767	871	864	3,501
Farms	107	168	384	483	257	1,399
Households	1,290	771	1,365	1,383	1,157	5,966
Total	1,902	1,433	2,516	2,737	2,278	10,866

[a]Collected by face-to-face interviews

Table 1.3 Methods used in this research

Method	Subject	Chapter
1. Multinomial logit model	Spatial shopping behaviour of Dutch households	3
2. Censored regression model	Off-farm labour income	4
3. Social accounting matrices	Economic linkages between town and hinterland actors in 30 European towns	5
4. Microsimulation	Development of a micropopulation of two Dutch towns including many household characteristics	6
5. Micro-macro-integration	Micro- and macro-effects of future developments on the local retail sector	7

For each town (zone A) and the immediately surrounding countryside (zone B), information was gathered from a systematic sample of households, farming and non-farming businesses using postal questionnaires and face-to-face interviews (see Terluin et al. 2003; Mayfield et al. 2005). The total database consists of more than 10,000 households, farms and firms, as shown in Table 1.2.

1.6 Relevant Methodologies

In this study, we look at a heterogeneous group of towns and their hinterland with reference to a multidimensional prism. Each facet of the prism is connected to a specific empirical research question requiring a specific methodology, as shown in Table 1.3.

1.6.1 Multinomial Logit Model (MNL): Spatial Determinants of Shopping

Because the importance of towns as a place to shop appears to be significant, we are interested in the spatial and socio-economic factors that determine the location choice of local households' shopping activities. In order to analyse the impact of a set of relevant variables on the revealed location choice, a multinomial logit (MNL) model is used in Chap. 3. An MNL model consists of utility functions related to the choice of a set of alternatives. In this study, the MNL model estimates the utility for

Dutch households to shop in zone A, B, C, or D (the Rest of the World, ROW). With help of these four utility functions, the probability that household i will shop in each of the above-mentioned zones was estimated by comparing the utility of, for example, zone A with the utility of all four zones.

In the literature it has often been argued that many shopping trips are multi-purpose trips, which means that the purchase of different goods and services is combined. However, we decided to run the MNL model separately for run (grocery), fun, and goal shopping, because we assumed that most trips have a main purpose. The (significant) different parameters in the three MNL models validate this decision.

1.6.2 Censored Regression Model: Off-Farm Labour Income

As more and more farm households obtain additional income from off-farm employment in rural areas an analysis is made to determine how farm, household and spatial characteristics affect the choice for off-farm employment.

To estimate the share of off-farm income in total farm household income, we use a tobit model in Chap. 4. A tobit model is a regression model in which the dependent variable is observed in only some of the ranges. The model can also be referred to as a censored regression model. It is a standard regression model, where generally all negative values are mapped to zero (this means that observations are censored (from below) at zero). Because we use percentages of total household income, we have an upper and lower limit in the data (respectively 0 and 100%). Therefore, a two-limited tobit model will be used, with three groups of explanatory variables: farm characteristics, household characteristics, and spatial characteristics.

1.6.3 Social Accounting Matrices (SAMs): Spatial Economic Structures

A SAM is an analytical and predictive tool to represent and forecast the system-wide effects of changes in exogenous factors. It consists of a data system of income and expenditure accounts, linking production activities, factors of production, and institutions in an economy. Although SAMs have their disadvantages (such as the assumptions that all firms in a given industry employ the same production technology, or that the production accounts are essentially based on a linear production technology) which reveals something about the inflexibility of these models, the great advantage is their ability to capture a wide variety of developments in a (macro) economy, as they link production, factor, and income accounts. In Chap. 4, the SAMs of 30 European towns are used to analyse the relationships between town and hinterland actors and their exploitation of the local economy from a macro-economic point of view. The SAMs describe linkages between town, hinterland, and the ROW: they are interregional. For the generation of the interregional SAMs,

the most important data are the national input-output table (which was regionalized using the GRIT method) and secondary data, such as number of firms or number of jobs, obtained from government institutions and from a large number of local firm, farm, and household surveys (collected in the EU-project Marketowns).

The similar way in which local information (both from governments and from questionnaires) has been collected, and in which the SAMs have been developed, enabled us to make a unique comparison between relatively small economic areas.

1.6.4 Microsimulation (MSM): Composition of Households in Town and Hinterland

MSM modelling is a technique that identifies and represents individual actors in the economic system and their changing behaviour over time. It enables us to obtain in-depth information on the behavioural responses of households to future developments by allowing the maximum level of heterogeneity between them. In a second stage, these results can be aggregated to macro-levels.

In Chap. 6, the development of SIMtown is described. The aim was to develop a micro-population suitable for the analysis of spatial shopping behaviour, and to show the usefulness of spatial MSM in spatial information provision. The information created by MSM is mostly based on complex but well-founded rules. During the development process, a number of choices had to be made, concerning, for example, the micro-data set (which needed to be reweighted) and the constraint variables. It appeared that the most suitable micro-data set was the large general data set, rather than the small (more specific) local ones. Furthermore, it appeared that, when a (relatively) large number of constraint variables were included (namely, six), the statistical errors were the lowest. But, not all available constraint variables were included: some did not add anything extra to the model. However, the process also showed that a simple MSM model can manage with a small number of constraint variables.

When SIMtown was operational, it was used for spatial-analyses, showing that MSM can be a useful tool in providing specific detailed information that was not previously available about households at a low geographical scale.

1.6.5 Micro- and macro-approaches

An interesting aspect is the combination of micro- and macro-tools used in this book in order to obtain a broad picture of the current situation. The term ‘micro’ in economics is often used for the study of the behaviour of individual economic units, while ‘macro’ is more related to the relation between broad economic aggregates (Janssen 1990).

The advantage of macro-models is that they often show a broader picture of the topic concerned. A social accounting matrix, for example, shows linkages between a network of firms, as well as between firms and households, in a predefined area. It gives an overview of the total (economic) situation. However, information about the distribution of certain impacts over different groups of actors is limited, and the relationships described are fixed with no room for changes. An advantage of micro-models is their focus on a single group of actors. The level of detail, including many relevant characteristics of the subject of interest, allows the estimation of linkages or relationships in a more extensive and flexible way. Unlike social accounting, which deals with averages of actor groups, micro-models, such as microsimulation models, provide data for individuals, households and other relevant behavioural units. This implies that the distributional pattern of impacts can be obtained to almost any level of detail required, given an adequate data source (Isard et al. 1998).

All in all, this book will show an interesting range of analyses, varying from macroeconomic analyses of the local economy in five different countries to the simulation of the total population of one Dutch town at postcode level. The availability of very detailed information of 6,000 European households, on the one hand, and of 30 macroeconomic town models, on the other, will allow us to analyse many different aspects of town-hinterland relationships in order to reveal the importance of towns to the regional economy.

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Appendix A1.1: Names of the 30 selected towns

Country	Towns
England	Leominster
	Swanage
	Towcester
	Tiverton
	Burnham-on-Sea
	Saffron Walden
France	Brioude
	Prades
	Magny-en-Vexin
	Mayenne
	Douarnenez
	Ballancourt-sur-Essonne
The Netherlands	Dalfsen
	Bolsward
	Oudewater
	Schagen
	Nunspeet
	Gemert

(*continued*)

Poland	Glogówek
	Duzniki
	Oźarów
	Jędrzejów
	Ultsroń
	Lask
Portugal	Mirandela
	Tavira
	Lixa
	Vila Real
	Silves
	Esposende

Chapter 2
Town and Hinterland Interactions in Rural Areas

Abstract We can look at urban centres as advantageous exchange points for producers and consumers, in which both agglomeration economies and scope economies have a higher probability of occurring. History justifies this argument, and experience underlines the importance of towns in their organizational capacity. In this chapter we explore town and hinterland interactions in a conceptual and theoretical way. First, of all we look at rural areas and the agricultural sector. Then we will focus on processes of urbanization, which leads us to a theoretical discourse about towns, inspired by, amongst others Christaller and Lösch. The last stage of the analysis, integrates all the foregoing elements into a conceptual framework of town-hinterland functions.

2.1 Introduction

The very first towns could only develop because the production of agricultural products exceeded the direct local demand. Consequently, some members of the local community could specialize in certain activities, such as religious, political and health care activities, apart from agricultural production. A very important factor for the further development of towns was their contribution to the organization of production and consumption processes, resulting in increasing economic efficiency in rural areas.

In this chapter we explore town and hinterland interactions in a conceptual and theoretical way. First, in Sect. 2.2, we look at rural areas and the agricultural sector. In Sect. 2.3, some background of Dutch rural areas is described. We will then focus on processes of urbanization in Sect. 2.4, which leads us, in Sect. 2.5 to a theoretical discourse about towns, inspired by, amongst others Christaller and Lösch. In the last stage of the analysis, Sect. 2.6 integrates all the foregoing elements into a conceptual framework of town-hinterland functions. Finally, in Sect. 2.7, future challenges of town-hinterland interactions will be described.

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2.2 Rural Areas

2.2.1 What Is Urban and What Is Rural?

The linkages between urban centres and the countryside, including movements of people, goods, capital, and other social transactions, play an important role in processes of rural and urban change. But the ways in which the various nations define what is urban and what is rural can be very different. The demographic and economic criteria on which definitions of urban and rural areas are based can vary widely between different nations.

According to Frey and Zimmer (2001), there are three elements which best distinguish an area's urban or rural character. First, there is the ecological element, which includes population and density. In general, all settlements above 2,000 or 2,500 inhabitants are considered urban, but in some countries settlements with only a few hundred inhabitants are sufficient to qualify as urban. In Switzerland, for example, communes of over 10,000 inhabitants (including suburbs) are categorized as urban, while in Norway and Iceland communes with more than 200 inhabitants are called urban (United Nations 2000).

Secondly, there is the economic element, which refers to the function of an area and the activities that take place. In rural areas, the share of agricultural activities is relatively high, in urban areas the majority of economic activities are organized around non-agricultural production. In urban areas, the diversity of different activities demands a diversely-orientated labour force. This tends to increase the number of people commuting. Therefore, commuting patterns are often used for defining an urban space. This happens, for example, in northern Nigeria, where the costs of food and accommodation in the cities are very high, leading to high levels of daily commuting from peripheral villages. Another example is the Netherlands, where both urban areas and cities are easy to access by public transport or car. Therefore, the national criteria for urban settlements in the Netherlands are: Urban-municipalities with a population of 2,000 and more inhabitants; Semi-urban-municipalities with a population of less than 2,000 but with not more than 20% of their economically-active male population engaged in agriculture; and specific residential municipalities of commuters (United Nations 2000).

The third element which distinguishes urban from rural areas is the social character of an area. Differences appear, for example, in the way urban and rural people live, i.e. their behavioural characteristics, their values, and the way they communicate. However, these factors are difficult to measure, and hence there are many different ways of defining what is urban and what is rural.

2.2.2 The Agricultural Sector

As mentioned in the previous section, an important characteristic of rural areas is the presence of the agricultural sector. Agricultural activities are not evenly spread

over the surface of the world. There are many reasons for that. Land has varying degrees of suitability for agricultural activities due to physical constraints (mountains, water, or salinity). Other parts can be in non-agricultural use (infrastructure, urban development, recreation, nature reserves). The proximity of markets and the density of population play a role as well. On average, in the EU-15 about 52% of the total area is used for agriculture, but with significant differences: ranging from 7% in Finland to 79% in Denmark (European Communities 2004). There are also important regional differences in the mix of agricultural activities, and in the intensity of land use. In some regions, more extensive production activities are located; in other regions, more labour-intensive ones (van Leeuwen et al. 2010).

From an economic point of view, the agricultural sector has lost its important position in most developed countries. According to United Nations figures, the share of the GDP produced by the agricultural sector in Europe has decreased in almost every country in the last 10 years (see Table 2.1).

However, large country-specific differences exist between the EU Member States (both the EU15 and the EU27). The contribution of the agricultural sector to

Table 2.1 GDP by major economic sectors, 1995 and 2003

	1995			2003		
	Agriculture	Industry	Services	Agriculture	Industry	Services
European Union (EU-15):						
Austria	2.5	30.8	66.7	2.2	30.3	67.5
Belgium	1.6	28.1	70.3	1.3	25.6	73.1
Denmark	3.6	24.9	71.5	2.3	25.2	72.5
Finland	4.7	32.2	63.1	3.4	30.4	66.2
France	3.2	26.3	70.5	2.6	23.8	73.6
Germany	1.3	32.1	66.6	1.1	28.6	70.3
Greece	9.9	22.4	67.7	6.6	22.9	70.5
Ireland	7.7	38.2	54.1	3.2	40.5	56.3
Italy	3.2	30.1	66.7	2.5	26.6	70.9
Luxembourg	1.0	21.2	77.8	0.5	16.3	83.2
Netherlands	3.5	27.8	68.6	2.3	24.8	72.9
Portugal	5.2	30.0	64.9	3.7	26.7	69.6
Spain	4.4	29.6	66.0	3.2	28.5	68.3
Sweden	2.7	30.1	67.2	1.8	27.3	70.9
United Kingdom	1.8	30.9	67.3	0.9	25.9	73.2
Other Europe:						
Turkey	15.7	31.9	52.4	11.5	27.4	60.9
Albania	54.6	22.0	23.4	27.1	17.1	55.8
Bulgaria	13.4	32.4	54.3	11.4	30.0	58.6
Croatia	10.4	33.4	56.3	8.0	28.9	63.1
Poland	6.9	7.3	33.3	3.0	30.7	66.3
Romania	20.9	40.3	38.8	12.9	37.8	49.3
Slovenia	5.5	41.7	52.8	3.1	35.4	61.5
North America:						
Canada	2.9	30.7	66.4	2.6	30.1	67.3
United States	1.5	27.0	72.3	1.6	24.5	73.9

Source: United Nations 2005

GDP in 2003 varies between 6.6% in Greece and 0.9% in the United Kingdom. The equivalent range for the other European countries is between 12.9% in Romania and 3.0% in Poland. Nevertheless, in the non- EU-15 states, often a larger share of jobs is found in the agricultural sector.

The decline in GDP or Gross Value Added (GVA) for the agricultural sector, especially in the new Member States, can be explained, for example, by growing national incomes. Increase in the national income of a country is closely linked with the rapid development of new branches of activity, particularly market services, which grow in relative terms. In addition, the importance of industry has also been decreasing over the years.

Overall, the level of agricultural employment is decreasing in Europe. But, even though farmers are a minority group in the countryside, they are still the main managers of the land, and agricultural work largely determines the degree of attractiveness of these regions, particularly where the landscape is concerned (Barthelemy and Vidal 1999).

2.2.3 A New-Farming Context in Europe: Post-Productivism

In peasant society, agriculture was the main activity, but the farmers also performed many other tasks: farming was multifunctional by nature. But, with modernization, farming has become 'just' one occupation amongst many others. At the individual level, this structural differentiation is visible in the growing specialization of labour: holders of formerly mixed small farms have been advised to opt for one branch (farm specialization) and scale enlargement. Many smaller farms have had to close down, while the size and productivity of the remaining farms has increased. Higher yields, efficient management, and increasing external inputs have all contributed to an increase in productivity (Luttik and van der Ploeg 2004).

Especially after the Second World War, when many countries in Europe were short of provisions, it seemed very important to modernize the agricultural sector and to produce as many products as possible. But, after some years (in the mid-1980s), the policy of self-sufficiency resulted in excessive surpluses in the form of beef and butter mountains and milk and wine lakes. This had to result in changing agricultural regimes: from a main focus on the production of food and fibre, known as 'productivism', to a focus on a multitude of functions with an emphasis on food quality and environmental conservation, referred to as 'post-productivism'. According to Ilbery and Bowler (1998) and Kristensen et al. (2004), the shift from productivism to post-productivism implies that agriculture, on a general level, is moving away from intensification, specialization and concentration, which are characteristics of the productivist farming period, towards extensification, diversification and dispersal, all of which are indicators of the post-productivist farming period. It seems that, after a period of trying to fully control nature by turning ecosystems into quasi-industrial areas with controlled water levels and insecticides in order to decrease natural processes as much as possible, the negative effects

(disturbed ecosystems, surpluses of manure, cattle diseases, etc.) were beyond expectations. As a result, the agricultural sector will have to focus more on food quality, environmental processes, and a more sustainable use of ecosystems.

In the developed regions, much of the debate about the agricultural sector focuses on agriculture's ability to produce joint products. This new farming context in Europe, with a variety of goals and actions, is resulting in a more diversified use of rural areas, somewhat similar to the diversified use of rural areas before the productivism period, but with a less significant role for the agricultural sector. In developing countries, it is not yet an option to enjoy non-production benefits from the agricultural sector. The most important reason for this is food security and the role of agriculture in alleviating poverty. In the initial stages of development of a region, food represents a major share of the household budget. When agricultural production increases, the real prices of non-tradable food products may decline, and the income of smallholders may increase (Bresciani et al. 2004). This means that agriculture is still the most important function in those rural areas, and that intensification is often necessary. According to Bresciani et al. (2004), development or transformation of the agricultural sector can slow down the rate of rural outmigration, thus preventing population concentration in metropolitan cities and leading to a more balanced distribution of population over space.

2.2.4 Specialization in Agricultural Activities Related to the Level of Rurality

The urban system has always been very important for the allocation of agricultural activities. In early times, people settled in the most fertile areas, because the lack of transport facilities meant they had to live where the food was being produced. Production, processing and consumption were thus located in close proximity. During the Industrial Revolution, a demand for (cheap) labour arose in urban areas, creating competition for labour. As a result, the farms near cities increased their labour productivity, leading to greater specialization and intensification near the cities (Rienks et al. 2005).

There are several economic and geographical concepts which try to explain different land-use patterns in different areas. Famous economists such as von Thünen (1826) and, more recently, Krugman (1991) claim that especially perishable and high yielding agricultural products are likely to be produced closer to the market, and closer to the main infrastructural network. Furthermore, because some agricultural products are more labour intensive than others, and labour-intensive products tend to be produced where land is relatively scarce, one can also expect labour-intensive types of production close to urban areas (Hayami and Ruttan 1971).

From a study on regional concentration and specialization of agricultural activities (van Leeuwen et al. 2010) it appears that land-intensive, high yielding products do indeed tend to be produced in more urbanized regions. In this study long-term developments in various types of agricultural production are related to

a number of socio-economic variables in order to explore regional trends in agricultural specialization between 1950 and 2000. In the EU9, 79 regions were classified according to their population density into rural regions, intermediate regions, and urban regions (see Terluin 2001).

The analysis of regional specialization (production of a product in a region related to the total production in a region) showed that most regions specialize in animal husbandry are rural regions and most regions that specialize in crops are rural and intermediate regions. However, a main difference is the type of specialization: rural regions tend to specialize in sheep, wheat and corn; and the urbanized regions specialize more in pigs, potatoes and sugar beet. Furthermore, the most important changes between 1950 and 2000 in the production of animals and crops is the increasing specialization in urban regions. Concerning the production of pigs, it was found that in 1950 the rural regions specialized in this type of production. However, by 2000 a stronger specialization was found in the urban regions. To a great extent, the underlying reason for this can be found in the agricultural policy of the EU, which favoured pig production in regions with good accessibility to feed components from overseas (Blom 1992). Pig production moved to regions with harbours nearby and high-quality hinterland infrastructure, primarily urbanized regions.

In addition, there was also a clear relation found between the degree of rurality and the level of specialization in certain arable crops. Potatoes and sugar-beet, labour-intensive crops with high returns per unit of land, are primarily found in urban regions. On the contrary, rural areas specialize more in cereal crops: wheat, barley, and corn. These crops are less labour-intensive and have lower returns per hectare.

2.3 Rural Areas in the Netherlands

According to the OECD definition of what is rural (less than 150 inhabitants per km^2), the Netherlands has no rural areas. It is actually one of the most urbanized countries within the OECD: 85% of the population lives in an urban region. Nevertheless, the agricultural sector is a strong sector; together with the sectors closely linked to agriculture, such as the food industry, it makes up around 10% of GDP (OECD 2008). Furthermore, rural areas have an economic performance that is similar to the Netherlands as a whole (Terluin et al. 2005). Although there are certain challenges, such as persistent unemployment differentials and lack of innovations, these challenges are not caused by the level of rurality (OECD 2008).

2.3.1 The Countryside as Romantic Ideal

From a historical perspective, the countryside has for many persons been a pleasant place for rest and relaxation. It is often associated with nature, tranquillity and

beautiful scenery. For many painters and poets, the countryside has been an important source of inspiration.

Since the sixteenth century, the level of urbanization in the Netherlands has been one of the highest of Europe. Generally, the city and countryside were seen as two different and separate worlds. Until the twentieth century, the contrasts between the city with its education, culture, and material consumption and the surrounding, often poverty-stricken, countryside were striking. Apart from the production and consumption of agricultural products, these two worlds appeared to meet only during weekends when citizens went beyond the city boundary to breathe some fresh air.

In the nineteenth century, the idealization of the rural landscapes remerged as a logical result of all the rapid and profound changes in society, economy, and landscape. Out of this turmoil emerged nostalgia for a simpler life: the countryside ideal (Bunce 1994).

Today, the Dutch have more time for leisure than ever: around a third of the employees work less than 4 days a week, and this number is increasing. Many of these persons spend their free time walking and cycling through the countryside. In addition, riding horses and playing golf have also become popular activities. However, particularly the growing number of golf courses and horse-riding facilities is having a great impact on the rural landscape.

2.3.2 The Countryside as an Economic Powerhouse

In the Netherlands, trade and agricultural activities have always been important sources of (national) income. Particularly in the lower areas of the Netherlands, with fertile clay soils and many waterways (for transportation), the level of productivity was relatively high (see also Hidding 2006). Until 1950, the countryside and agricultural activities were strongly related. In these areas, as in cities, the gap between rich and poor was often immense. After the Industrial Revolution, many (poor) peasants migrated to the cities where new jobs had emerged. The increasing emphasis on manufacturing and other non-primary activities in the economy favoured the concentration of economic activities in the major urban centres of countries, and, at the same time, the new developments reduced the primary labour force necessary to satisfy given levels of demand (Bryant et al. 1982).

In the post-war period, however, new technological developments, as well as improved education and better accessibility resulted in a flourishing rural economy. The Dutch agricultural sector became an important export sector, particularly in flowers and cheese. Nowadays, the Netherlands is one of the three biggest exporters of agricultural products (together with the United States and France).

Nevertheless, as in other parts of Europe, the resulting conflicts between (animal) health and ecological qualities have restricted the activities of farmers. Since 1980, the number of farms in the Netherlands has halved. Nevertheless, the area in agricultural use decreased by only 6%. This is because the size of the farms has

increased: the number of farms of more than 100 ha has increased as much as fourfold since 1980. Of course, this has, and will have, an effect on Dutch rural areas: for example, on the spatial characteristics of rural landscapes or on the quality of ecosystems.

2.3.3 The Countryside as a Realm of Life

After the Second World War, a period of suburbanization started when rural areas became more and more a place of overspill to reduce population pressure in cities. Those urbanites who could afford it preferred healthier and greener (medium-sized) towns, often located near the large cities (Robinson 1990). In the Netherlands, this resulted in sprawling urban districts (for example, the Randstad) instead of large cities. In fact, nowadays, on average, population growth in Dutch rural areas is higher than in the urbanized areas.[1]

Unlike other countries, such as England or France, the overall equality of basic (service) conditions in urban and rural areas is striking. According to a study by Koomen (2008), on average, the development of the level of facilities in the small settlements is keeping pace with the trends for the Netherlands as a whole: the number of retail outlets (shops), schools and banks/post offices is slightly decreasing, while the number of catering establishments and basic medical services is increasing a little. Nevertheless, not everyone experiences these developments as keeping pace with national trends. Some town-residents are worried about the seemingly decreasing levels of facilities. Of course, there are also some differences between rural and national trends: these are particularly related to a lower level of facilities for the elderly and a reduction in public transport.

Nevertheless, the availability of services and jobs, together with tranquillity, space and lower levels of criminality, result in a high quality of life for rural dwellers. According to the Social and Cultural Planning Bureau, using a composite index of eight important indicators of quality of life, this quality is in general higher in rural areas compared with cities (Boelhouwer 2006).

2.4 Urbanization of Rural Areas

In the eighteenth century, there was a significant difference between Eastern and Western Europe with respect to the social importance of towns. In Eastern Europe, towns were generally smaller and had little real autonomy. In Western Europe, they were larger and often a form of municipal self-government and municipal privileges existed. Except in the Dutch Republic, Britain, and parts of Italy,

[1]For an extensive description of the socio-economic situation of rural areas in the Netherlands, see Terluin et al. (2005).

townspeople were still a distinct minority of the total population. At the end of the eighteenth century, Europe had at least 20 cities (in 12 countries) with populations over 100,000, including Naples, Lisbon, Moscow, St. Petersburg, Vienna, Amsterdam, Berlin, Rome, and Madrid (Spielvogel 2005).

At the beginning of the industrialization period, living conditions in cities were very poor, resulting in high mortality rates and lower birth rates than in rural areas. It was only because of the large rural to urban migration that the cities were able to grow on such a large scale. The immigrating rural inhabitants were attracted by the demand for employment (the industrialization led to a decrease in agricultural employment because of new technologies) and higher wages (Frey and Zimmer 2001). Around 1940, more than half of the Western European population lived in urban areas.

After the Second World War, extensive suburbanization took place. Urbanites who could afford it preferred healthier and greener (medium-sized) towns, often located near the large cities. This stimulated not only the growth of commuter villages but also some urban to rural migration affecting more remote rural communities. As a result, the population in big city centres decreased. Suburban growth (people moving to areas just around the city) in the 1970s was even accompanied by falls of 15% or more in the population of the inner areas of cities in many parts of the developed world (Robinson 1990). The people who remained in the inner area of the city were often the people with lower incomes.

According to Johnston (1983), there are three different ways to refer to urbanization. The first is as a demographic phenomenon, in which an increasing proportion of the population is concentrated in urban areas. When we focus on urbanization as a demographic phenomenon, it appears that official figures indicate that around 75% of the population of the more developed world are considered to be urbanized. In the future, this will be around 80–90%, according to the United Nations (see Table 2.2). However, at least in the developed world, this upcoming urbanization will no longer consist of growing metropolises, but mainly of the reclassification of existing rural settlements as a result of the outward spread of cities. Several studies suggest a progressive redistribution of population down the urban hierarchy, either through a relatively faster growth of smaller urban places or through the absolute decline of the largest cities (Champion 2001).

Table 2.2 shows that the average share of the world population living in urban areas was 48.3% in 2003. The United Nations predict that in 2030 this will be almost 61%, with most of the growth taking place in the least developed regions (from 26.6% in 2003 to 43.3% in 2030). Unfortunately, in those regions most of the urban growth is taking place in mega-cities, reinforcing the existing problems of over-urbanization. Even in Europe, there are different levels of urbanization. In southern Europe, for example, only 65.8% of the population live in urban areas, whereas in northern Europe 83.3% do so. But, according to the calculations of the United Nations, these shares will eventually converge.

A second way to refer to urbanization is as a social and economic phenomenon inherent in capitalist industrialization, as urban areas facilitate linked production, distribution, and exchange processes.

Table 2.2 Urban and rural areas in 2003, projected to 2030

Area	Percentage of population living in urban areas		Average annual rate of change, 2000–2005 (%)	
	2003	2030	Urban	Rural
World	48.3	60.8	2.1	0.4
More developed regions	74.5	81.7	0.5	−0.5
Less developed regions	42.1	57.1	2.8	0.5
Least developed regions	26.6	43.3	4.3	1.7
Africa	38.7	53.5	3.6	1.3
Latin America and Caribbean	76.8	84.6	1.9	−0.3
Northern America	80.2	86.9	1.4	−0.7
Oceania	73.1	74.9	1.4	0.7
Asia	38.8	54.5	2.7	0.4
Europe:	73.0	79.6	0.1	−0.5
Eastern Europe	68.4	74.3	−0.4	−0.6
Northern Europe	83.3	87.7	0.4	−0.4
Southern Europe	65.8	74.1	0.3	−0.4
Western Europe	81.0	86.4	0.5	−0.7

Source: United Nations 2003

Thirdly, urbanization can be considered as a behavioural phenomenon, in which urban areas act as centres of social change. In this way, urbanization can be seen as a process of infiltration of the countryside by non-farm elements (Bryant et al. 1982). The growth of smaller urban places and the reclassification of existing rural settlements increase the spread of the urban lifestyle to more rural areas. When urbanites go to live in the countryside, they change the traditional lifestyle there, and this makes the distinction between urban and rural very blurred (Antrop 2004).

Another current development in the urbanization process is the growth of urban networks. A good example of an urban network is the Randstad in the Western part of the Netherlands. This network consists of Amsterdam, Rotterdam and The Hague (with Utrecht at the edge) and many smaller cities in-between. These growing cities eventually 'bumped' into smaller 'satellite' cities creating large urbanized areas in which the remaining open (agricultural) areas function more or less as parks for the urbanites. This development often leads to a more tense relationship between urban and rural areas.

2.5 Towns

2.5.1 Development of the First Towns

According to historians, the first cities emerged around 3500–3000 BC in the fertile river valleys of the Nile in Egypt, and the Indus in Mesopotamia, and the Hoang-ho in China. Ur was the largest of the cities with a population of about 25,000. More

than 1,000 years later, Babylon was the leading city of that time with 50,000 inhabitants. Nevertheless, populations in general remained rural and were mainly involved in agricultural production. Until 1850 (AD), around 4–7% of the people lived in urban areas (Frey and Zimmer 2001).

It is thought that the first cities served both defensive and religious purposes. When the farmers started to produce more products than they needed, they had to store the surplus of food for some time. Of course, the stored food was an interesting target for thieves, so it needed protection. Scale economies in protection led to the development of central storage facilities. The same holds for religious activities. According to Mumford (1961), cited in O'Sullivan (2000), large temples at central locations replaced small places of worship in homes and villages. As these temples employed religious workers, areas with higher population densities developed. In those times, it was mainly the richer people who could afford to live in the cities.

2.5.2 Theory of Regions and Central Places

The functional-economic analysis of regions already has a long research tradition in economic geography and regional economics. Walter Christaller initiated the discussion about the spatial distribution of cities and towns in 1933 as a result of his observations in the southern part of Germany. More than 10 years later, Lösch contributed to Central Place theory in a more deductive economic way (for details, see Paelinck and Nijkamp 1973).

The basic idea of spatial economic hierarchies starts from a farm that produces more than it needs. Therefore, it can start selling products to the market, but the transport costs will limit the geographic distribution of the products. According to Ponsard (1958), Lösch argues that the relationship between the cost curve and the demand curve (in fact, the price elasticity) determines the length of the sales radius. Given the assumption of uniformity, the market area will be a circle. If more farms enlarge their production, and thus their sales areas become spatially contiguous, the market shape will become a hexagon to avoid remaining empty spaces.[2] The market for that specific type of firm is then fully covered. Of course, in reality the economy is characterized by a range of different types of firms with specific products. These different types of firms have different demand curves and hence different price elasticities for the products they produce, leading to different market areas.

[2]The market shape can no longer be circular, as otherwise (at least if we assume space-filling configurations) that would not allow for empty spaces with a profit potential between them. These empty spaces would not be in agreement with the zero marginal profit condition for market equilibrium; hence, new firms would continue to enter the market, until all empty spaces are exhausted. Consequently, a network of hexagons is substituted for the circles, because hexagons are slightly smaller than the extreme sales circles. These hexagons are the most efficient (i.e. transport-cost-minimizing) uniform spatial configurations that are entirely space filling.

This means that the number of firms existing in a given space is determined by: the demand function of the products; their elasticities defining the different slopes of the demand curves; the transport costs; and the scale economies related to the market equilibrium concerned. In this way, each product leads to a different geographical production system, justified by the different possible combinations of underlying determinants. And, finally, the fact that it is possible to produce several different products at a time in the same geographical space leads to the emergence of a comprehensive spatial framework. Indeed, the overlapping of such systems creates market areas where agglomeration economies are easier to generate, facilitating the advantages of urban centres and the concentration of industrial activities.

According to Lösch, the most efficient economic landscape is the one where the maximum number of firms is located at the same point. This will then lead to agglomeration economies taking place within each group of firms located at the same place. Furthermore, an effective exchange arrangement, enabling producers to specialize, depends upon local collection points and larger regional assembly centres that are interlinked by a sales and payments system. This provides incentives for producers and, at the same time, facilitates the distribution of goods in accordance with consumer preferences (Johnson 1970). Finally, the economy of a spatial area will be dominated by a central city, and the hinterland will consist of smaller settlements and alternating areas of industrial concentration and dispersion (McCann 2001). The settlement hierarchy reflects the variation in thresholds and complementary regions, such that those settlements, or central places, at the top of the hierarchy offer both higher- and lower-order goods, thereby serving a wider complementary region than settlements at the bottom of the hierarchy, where only lower-order goods are available (Robinson 1990).

All the criticisms of Lösch's approach, which concern the homogeneous concept of space or the assumption of similar elasticities related to a specific demand function for a good, do not destroy the major contribution he made to a better understanding of why different firms tend to locate or to concentrate in different areas, whether or not they are raw-materials- or market-oriented.

2.5.3 Why Towns Exist

We can look at urban centres as advantageous exchange points for producers and consumers, in which both agglomeration economies and scope economies have a higher probability of occurring. History justifies this argument, and experience underlines the importance of towns in their organizational capacity. All in all, town growth has promoted the dynamism of industry and services, and these have changed the functionality of towns and cities.

As mentioned earlier, the very first settlements could only develop because the production of agricultural products exceeded the direct local demand. Later on, towns became marketplaces for economic activities and places where products were designed and often manufactured. In addition, towns turned out to be efficient

ways of organizing production and consumption which would not have been possible with a completely dispersed population (Marsden 1999).

The existence and development of towns can be related to three factors: spatial advantages; advantages of agglomeration of firms; and advantages of agglomeration of consumers (Lösch 1954).

Spatial advantages arise, for example, when sources of supply such as raw materials and intermediate products are available. Such site advantages can also consist of large transport nodes or the proximity of other towns. A firm that spends a large part of its total costs on a particular local input – an input that cannot be efficiently transported from one location to another – is pulled toward locations where the price is relatively low (O' Sullivan 2000).

The advantages of the agglomeration of firms appear when many (similar) enterprises are attracted to the same location because of the reduction of costs due to a large labour market, mutual stimulation, special facilities, and so on. Different enterprises can benefit from each other: for example, concerning the use of labour when their seasonal or cyclical variations do not coincide. Labour can, in general, move easily between firms, and firms are easily able to employ new workers. These interactions can act as a risk-reduction mechanism for both the firm and the employees regarding demand fluctuations (McCann 2004).

Finally, the agglomeration of consumers in a town attracts enterprises. First of all, proximity to consumers decreases transport costs. But another advantage is that, as buyers like to purchase certain differentiated goods where they can compare different varieties, a concentration of firms will increase demand for each good individually (Lösch 1954). This is particularly important in industries where firms do not only compete in terms of price but also engage in non-price competition, such as product quality competition.

The location of towns and their size is thus not coincidental, but is based on underlying economic forces. In addition the location and size of cities in a system of cities is co-determined by a broader functional-economic constellation of cities, where volume of transportation, logistics and product specialization play an important role.

2.5.4 Interdependency Between Towns and Rural Areas

It is often thought that less developed countries first need to develop agricultural activities, before other desirable developments will take place. However, according to Jane Jacobs (1969), it is the rural and agricultural areas that are dependent on cities, not the other way around. She states that it is in cities that new goods and services are first created, including innovations created specifically for farming. Already in medieval times, when households started to consume grain, probably only a little was obtained from the rural hinterland. Instead, most of it was cultivated by the city dwellers themselves in fields that were partly within the walls. In addition, the medieval cities must have been their own first markets for

metal agricultural tools made by their smiths. Only many years later did these tools become common in the rural areas as well.

Likewise, nowadays, agriculture is only really productive when it incorporates goods and services produced in cities, or transferred from cities, e.g. fertilizers, machines, refrigeration and the results of plant and animal research. The most thoroughly rural countries exhibit the most unproductive agriculture (Jacobs 1969). However, in near-subsistence economies it is hard so say whether it is the absence of markets which holds down the marketed surplus or whether it is the low volume and poor quality of the goods which impedes the development of a network of towns and marketplaces (Johnson 1970). Furthermore, it is incorrect to assume that urban entrepreneurial decisions are wholly discrete and separable from rural decisions and choices.

These days, when looking at the importance of small and medium-sized towns, there is, on the one hand, a trend of towns to become less important for local households as a result of, for example, the globalization of markets, the centralization of health and education services, the growth of new types of shopping facilities, the reduced cost of transport services, and the development of telecommunications networks. Most of these factors have reduced the transaction costs that in the past encouraged rural firms and households to conduct most of their transactions in the immediate locality (Marsden et al. 1993). However, on the other hand, the development of telecommunications networks, technological changes, and reduced transport costs also provide opportunities for a more diverse range of firms and individuals to relocate to some of the rural settlements.

There are several ways in which town and hinterland interact and how towns can benefit regional or rural development. Both Rondinelli (1984) and Satterthwaite and Tacoli (2003) have described how the mutual effects of urban and rural development are manifested. They can be summarized as shown in Fig. 2.1.

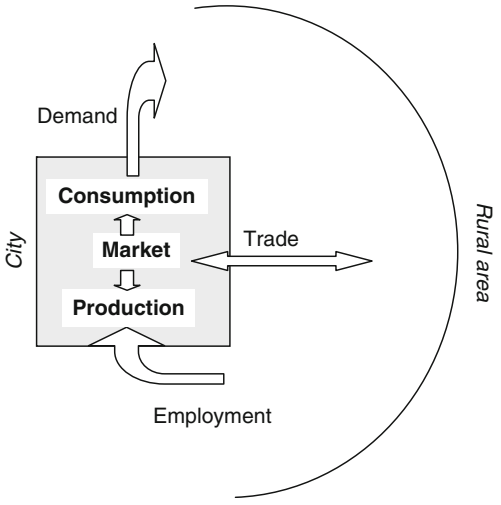

Fig. 2.1 Interdependency between urban and rural areas

First of all, agricultural development (in early times) provided a stimulus for urbanization and the economic diversification of cities in rural regions. Because cities function as agricultural supply centres and as locations for agri-processing and agri-business activities, right up to the present day employment opportunities have been provided for urban workers in a large number of commercial and service activities.

Secondly, towns provide markets and act as centres of trade for agricultural goods. Urban population growth and agglomeration create increased demand for agricultural products and leisure activities from (nearby) rural areas. The greatest stimulus from agriculture for small and intermediate urban centres tends to be where crops or other products generate a high income per hectare. However, in agricultural regions dominated by large-scale commercial agriculture, most small and intermediate urban centres do not have major roles as markets for agricultural produce. Furthermore, towns provide opportunities for off-farm employment.

Thirdly, towns can act as centres for the production and distribution of goods and services to their rural region. The level of service provision is dependent on the nature of local rural economic activities and, related to this, the income levels and purchasing power of the rural population. Furthermore, the capacity of local enterprises to meet the local demand is of importance. The quality and nature of the services and goods provided must be able to respond to local demand in the face of competition from elsewhere.

Finally, particularly in less-developed countries, towns can contribute to regional and rural development by attracting rural migrants from the surrounding region through demand for non-farm labour and thus decreasing migration pressures on some larger urban centres.

2.6 Town and Hinterland in a Model: Values, Activities and Actors

2.6.1 Functions of Rural Areas

The new farming context, with a variety of goals and actions, is bringing about a more diversified use of rural areas, somewhat similar to the use of rural areas before the productivism period, but with a less significant role for the agricultural sector (see Wilson 2001). Increasing leisure time and greater mobility of residents is generating a higher number of visits to rural areas. As well as that, environmental quality attracts residents who want to live in the countryside. The renewed awareness of the value of nature, culture, and landscapes is encouraging the conservation of these elements.

Another important development is the increasing interest in climate change and the role of rural areas. Apart from being the lungs of the world, rural areas are also more often seen as places that can contribute to water safety because they can act as

buffers in periods of water shortage and water abundance. In many countries, recent policies are shaping new approaches to flood risk management in rural areas in the future. The potential contribution of rural land management to the management of flood risk can be of utmost importance. This includes measures to control runoff from farmland, retaining water on farmland in the higher parts of catchments as well as storing it on floodplains in the lower parts of catchments (Posthumus et al. 2008).

Williams (1969, in Bryant et al. 1982) divides the functions of open spaces (rural areas) into six classes;

1. Functions involving activities that are primarily located in the production function (e.g. agriculture or mineral production)
2. Functions involving especially natural and cultural values (e.g. sites of particular biological or cultural values)
3. Functions related to health, welfare and well-being, including 'protection' functions and 'play' functions (e.g. the maintenance of, respectively groundwater quality and recreation areas)
4. Functions related to public safety and natural or man-made hazards (e.g. flood control and aircraft flight paths)
5. Space for corridors and networks (e.g. infrastructure and nature networks)
6. Space for urban expansion

In line with Bryant et al. (1982, p.155), it seems that, in rural areas, we are increasingly "confronted with a situation of an environment containing various resources, each possessing a range of potential and actual uses or functions, and each associated with different values assigned by individuals, groups and various formal government structures".[3] It is particularly this range of uses or functions, each appreciated in a different way by several actors, which is creating a complicated situation and problems which are difficult to solve. Our next step is to describe these relations in a schema.

2.6.2 *Conceptual Framework of Town-Hinterland Functions*

To describe the urban-rural interactions between town and hinterland, we make use of systemic network perspectives. These perspectives refer to complexes of elements or components, which mutually condition and constrain one another, so that the whole complex works together. The analysis of a system comprises key features such as purposes, interaction, integration and their emergence (Rametsteiner and Weiss 2006).

[3]Again, we can make a distinction between the economic subsystem with its uses or functions of rural areas, the cultural subsystem, including the values assigned to these functions, and the political subsystem which tries to integrate the former two subsystems.

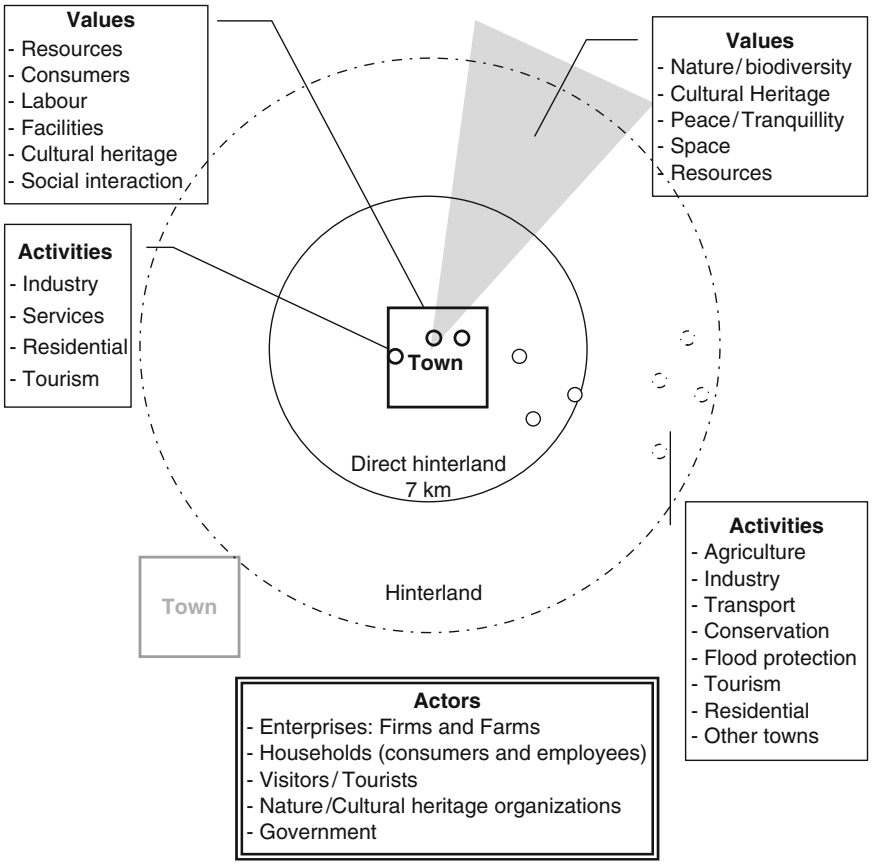

Fig. 2.2 Actors, activities and values in the town and hinterland

Figure 2.2 shows the different uses/activities which take place (as part of the economic subsystem), the values/resources which are present (derived from the cultural subsystem), and the actors or users of the town and hinterland. In the following tables (Tables 2.3 and 2.4), we also describe problems or conflicts (in need of, or already involved with, respectively regulations and rules from the political subsystem).

In Fig. 2.2, we make a distinction between the towns, the squares in the figure,[4] and their (direct) hinterland, the surrounding circles. In the hinterland, several values are present: there are resources located in various places; open space is available; often plants and animals can be found; cultural heritage in the form of old

[4]The black square represents the town under research, the grey square represents a (smaller) town located in the hinterland.

farms, mills etc. is present; and one can enjoy a certain amount of peace and tranquillity. These values allow certain activities to take place. The activities we distinguish are closely related to the six functions of open space described by Williams (1969) (see Sect. 2.6.1 above). First, we distinguish production activities, such as agriculture, industry, transport, the conservation of nature and cultural heritage and flood protection. In addition, consumption activities take place, such as tourism and residential activities. Finally, infrastructural networks and other towns are located in the hinterland.

Certain values are also found in the towns. First, available resources can be the reason for the establishment of the town. Furthermore, a market of consumers and employees is available, as well as various facilities, cultural heritage, and social interaction. These values are a result of, or they result in, a range of activities. Activities related to production are industrial and (public) service-related activities. On the consumer side, the town is used for residential activities and recreational or tourism activities.

According to Bryant et al. (1982), values and activities in rural areas are appreciated in different ways by different groups in society. Therefore, in this framework, we first distinguish the actors in the town (see Table 2.3) and hinterland (see Table 2.4). We have divided the actors by their (main) role in the production or consumption landscape. In the next column their activities are described, followed by two columns listing, respectively, the related values and possible problems.

Table 2.3 Actors, activities, values and problems in the production and consumption landscape of the town

	Town			
	Actors	Activities	Values	Problems
Production landscape	Firms	Industry, services, transport	Primary Resources, Agglomeration of activities, Consumers and labour market	Pollution, policy restrictions, lack of consumers, congestion
	Households (employees)	Working activities		Lack of skilled personal (low education)
	Government	Public services		Lack of consumers, high expenses
	Cultural heritage organizations	Conservation	Cultural heritage	Pressure on cultural heritage
Consumption landscape	Households	Shopping, residential activities, recreation	Facilities, social interaction, ethical values	Pressure on cultural values, lack of facilities, no local involvement
	Visitors/ Tourists	Shopping, recreation	Facilities, cultural heritage	Pressure on cultural values, lack of facilities

Table 2.4 Actors, activities, values and problems in the production and consumption landscape of the hinterland

	Hinterland			
	Actors	Activities	Values	Problems
Production landscape	Farms	Agriculture, recreation, transport	Primary resources, space/openness	Pollution, policy restrictions, congestion, urban pressure
	Firms	Industry, services, transport		
	Government	Flood protection, conservation of nature and cultural heritage	Space, biodiversity, cultural heritage	(Policy) restriction to other activities
	Nature and cultural heritage organizations	Conservation of nature and cultural heritage	Biodiversity, cultural heritage	
Consumption landscape	Households	(Second) houses, recreation, travelling	Biodiversity, cultural heritage, peace/quietness/ space	Pressure on biodiversity, cultural heritage, peace and quietness
	Visitors/ Tourist	Recreation, travelling		

2.6.3 Town Actors

Small and medium-sized towns (SMTs) in rural areas are often attractive tourist places. The old market, church, and city hall tell us something about the importance and role of towns many years ago. Then, they were places where products were bought and sold, deals were made: they were trading places. Residents from smaller towns or from the countryside regularly visited these market towns for business and pleasure. Although the role of SMTs is no longer that important anymore, the same kind of actors are still present.

The first group of important actors in the production landscape are firms (see Table 2.3): not only industrial firms but also service firms. Industrial firms can be attracted to a town because of the presence of primary resources or because of other spatial advantages, such as the proximity of a river. More often, they are located in a town because of the advantages associated with the agglomeration of firms, a situation which also holds for service firms. Firms are also attracted to towns because of the consumer market. Retail shops, hairdressers, and other service firms sell their products and services to the households which demand them.

The second group of important actors in the production landscape of the town are the households. They are part of the labour market and, according to earlier research, in particular small local firms employ local labour (from the town and its direct hinterland) (van Leeuwen and Nijkamp 2006).

The third important actor is the government. It provides public services, and maintains the (green) environment and infrastructure, often using local employees.

The final group of important actors in the production landscape are the cultural heritage organizations which produce city landscapes from the available cultural heritage which can be consumed by households and visitors.

In addition, we can also distinguish two groups of actors in the consumption landscape of the town (Table 2.3). The first of these actors are the households, who use the town for their shopping, residential, and leisure activities. Households from the town itself and the direct hinterland make use of the facilities that are concentrated in the town. Important facilities are shops, but also schools and health care. Furthermore, social interaction attracts households to a town.

The second group of actors in the consumption landscape are the visitors or tourists. They visit the town to 'consume' the relative quietness and peacefulness, together with the historic charm: the cultural heritage. Of course, the availability of facilities, such as shops and cafés, is also important for tourists.

2.6.4 Hinterland Actors

Table 2.4 shows the actors located in the hinterland. These actors are often attracted to the hinterland because of the availability of space, special soil qualities, or the availability of infrastructure.

An important group of actors are the farmers. A unique feature of the agricultural sector is its physical link to the soil conditions, and therefore its strong relationship with its surroundings. Although in most rural areas the primary sector has become less important in terms of its economic weight and share in employment, farmers are still the main land users and they play a key role in the management of the natural resources in rural areas and in determining the rural landscape and cultural heritage (van Leeuwen and Nijkamp 2006).

Firms are the second important group of actors. They are attracted to the hinterland by the availability of primary resources and space or by the presence of other firms or farms (agri-business). Furthermore, the government and nature and cultural heritage organizations can also be seen as actors in the production landscape of the hinterland. Besides the 'production' of infrastructure by the government, they are all active in the production and conservation of rural landscapes.

The actors of the consumption landscape are, just as in the towns, households as well as visitors or tourists. In the hinterland, they enjoy the landscape, biodiversity, tranquillity and rest. Besides that, the hinterland is also used to travel to other towns or areas.

2.6.5 Possible Problems and Difficulties

Most problems or difficulties arising in towns and their hinterland are related to sustainability and quality of life problems. Of course, this also holds for the larger

cities but, nevertheless, the problems are slightly different. According to the EU (Commission of the European Communities 2006), Europe's rural areas are diverse and include many leading regions. However, some rural areas, and in particular those which are most remote, depopulated, or dependent on agriculture, will face particular challenges as regards growth, jobs and sustainability in the coming years. These include lower levels of income, an unfavourable demographic situation, lower employment rates and higher unemployment rates, a slower development of the tertiary sector, weaknesses in skills and human capital, and a lack of opportunities for women and young people. In addition, there is also a range of pressures and trends currently negatively affecting the rural hinterlands across Europe. These include: soil erosion by water and wind; air pollution from ammonia, damage to water quality from nutrient enrichment and soil sediment deposition; unsustainable exploitation of water resources by extraction; loss and damage to biodiversity through habitat degeneration, destruction and fragmentation; and decline in landscape character and quality through homogenization and/or neglect of feature management. In aspects such as water quality and biodiversity, some negative trends in the EU-15 currently appear to have slowed down or been arrested, while they appear to be accelerating in the new Member States (Dwyer 2007). Just as in larger cities, the problems related to sustainability in towns are mostly related to pollution from traffic and industrial activities. In addition, congestion, from urbanites living in towns and working in cities, is becoming a more important issue. In the hinterland the agricultural sector in particular has to deal with sustainability issues. Much legislation and many of the subsidies and restrictions aim to improve environmental quality, but at the same time strongly affect farm activities.

Other problems are more related to quality-of-life issues. In many smaller towns, the availability of facilities is decreasing. For most town residents this is often not a major problem, but for certain households groups such as the elderly or the disabled this is a very important issue.

2.7 Future Challenges in Town-Hinterland Interactions

An important characteristic of rural areas is the dominant position of the agricultural sector. Not only is the production process of farms different from that of firms, but also the lifestyle of those persons active in the agricultural sector often differs from the rural lifestyle of those who are engaged in other non-farm activities. Also today, Europe needs its green areas and the agricultural areas embedded in them, but they will have to be reorganized to meet new needs and expectations (van der Ploeg et al. 2000). With the decreasing economic importance of agriculture, new economic activities are possible and necessary in rural areas in order to achieve more consistency between urban and rural areas.

The challenges for farms and firms in town and hinterland are quite similar. First of all, policy restrictions and legislation related to environmental problems require

farms and firms to produce in an efficient and sustainable way. For farms near towns or cities, this often means that they have to start engaging in new (additional) activities. Other farms will decide to produce their products in a very efficient and modern way, focusing only on (an almost industrial kind of) production. However, agricultural firms still play a very important role in maintaining cultural (agricultural) and sometimes natural landscapes.

For service-related firms (especially in the towns), a lack of consumers can affect their business. Town residents who used to live in the city, and who still have employment there, often do their shopping in the city as well. Furthermore, large shopping malls, located in the urban fringe tend to attract former clients of the shops in the town centre. In connection to this, creating cohesion between (local) activities could be a crucial strategic element, in particular when it results in synergy between different actors (Brunori and Rossi 2000).

When looking at the consumption landscape of town and hinterland, other challenges arise. In some areas, an increasing number of households in town and hinterland can put pressure on cultural values in the town and on natural values in the hinterland. This also holds for the growing number of visitors and tourists. Therefore, it is important to integrate new houses and new leisure activities in town and hinterland in a sustainable way. On the other hand, in some towns, the challenge is to have enough facilities for households and tourists. When people tend to buy more products in the city or in large shopping malls, smaller shops and service facilities can disappear from the town centre. This leads to an almost obligatory dependency of the town on the nearest big city, whereby the town only has a residential function. Either way, it seems that, in the future, city, town, and hinterland will become more dependent on each other and more similar concerning their economic and cultural characteristics.

Chapter 3
Multifunctionality of Towns: Exploration of the Spatial Behaviour of Households

Abstract In this chapter, first of all the importance of small and medium-sized towns for rural households in relation to shopping, working and living in five European countries will be described. This analysis demonstrates the different functions towns can perform in different European contexts. With the help of a regression analysis we explore the determinants of local orientation in shopping behaviour. We then turn our attention to households in a selection of six Dutch towns and describe their spatial shopping behaviour. A multinomial logit model is used to explain the choice of households to shop in town, or in the direct hinterland, or further away. We relate rural spatial-economic conditions, such as the accessibility and supply of shops, to the local households' socio-economic characteristics, such as place of work, age, and income. This helps us to understand which factors are important for the households' choice to use the town, or the hinterland, or a place outside the region for their shopping.

3.1 Introduction

Especially in the UK, small and medium-sized towns are seen as important components of the economic structure of the country, having the capacity to act as a focal point of trade and services for a hinterland (Countryside Agency 2000; Courtney and Errington 2000). Despite the lack of research into the role of (market) towns in alleviating problems in the provision of rural services, they are being targeted by UK government policy as centres for service provision and growth (Powe and Shaw 2004). Although it is likely that medium-sized towns do play an important role in servicing their hinterlands, it is unclear what form this takes and upon which (spatial) factors the role depends. Furthermore, there is likely to be a mutual dependence, where the viability of the services themselves is dependent upon trade from hinterland residents, and where many of these residents, particularly the less mobile, may also rely on such services within their own town or from the nearest town (Powe and Shaw 2004).

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According to Gauntlett et al. (2001), a strong and healthy community comprises residents who respect each other and are open to new developments, and, in addition, it should meet the basic needs of its residents, possess a diverse and innovative economy, and provide easy access to health services (see also Western et al. 2005). In this chapter, we focus on the variety of contemporary functions of towns which contribute to the socio-economic well-being of the rural population. In the literature, not many publications are found that deal with both services and employment in towns. Especially in the UK, many studies deal with (decreasing) local services, such as Higgs and White (1997), Moseley (2000) and Powe and Shaw (2004). However, none of these publications focuses on the provision of local jobs as well, and neither do they compare towns in different countries. In our opinion, towns are not only important to local households in providing services but also in providing local jobs. Therefore, in the first part of this chapter, the importance of small and medium-sized towns for rural households in relation to shopping, working and living in five European countries will be described. This analysis demonstrates the different functions towns can perform in different European contexts. We then turn our attention to households in a selection of six Dutch towns and describe their spatial shopping behaviour. With the help of a regression analysis we explore the determinants of local orientation in shopping behaviour. In addition, a multinomial logit model is used to explain the choice of households to shop in town, or in the direct hinterland, or further away. We relate rural spatial-economic conditions, such as the accessibility and supply of shops, to the local households' socio-economic characteristics, such as place of work, age, and income. This helps us to understand which factors are important for the households' choice to use the town, or the hinterland, or a place outside the region for their shopping.

3.2 Multifunctionality of Towns for Town and Hinterland Households

3.2.1 Towns as a Place to Shop

The functional relationship between a town and its hinterland can be indicated by a specific flow of products and services from the central place to its hinterland, or by a reverse flow of demand from the hinterland to the central place (Klemmer 1978). However, in smaller communities, the competitive nature of the rural market has significantly changed. Better travel conditions along with attractive regional shopping centres entice consumers to travel beyond their local markets. Although the high level of car-ownership in rural areas makes it easier for rural residents to 'use' local town facilities, it also allows them to travel even further, to larger cities (Miller and Kean 1997; Powe and Shaw 2004). Traditionally, towns act as a concentration point of facilities, both for households living in town (T-HH) and for

Table 3.1 Average supply of retail services in town and hinterland in five countries

	Average[a] number of shops		Average[a] number of inhabitants per shop		Average[a] number of employees per shop	
	Zone A	Zone B	Zone A	Zone B	Zone A	Zone B
England	92	19	115	652	7	13
France	112	41	116	317	–	–
Netherlands	113	188	118	167	5	4
Poland	317	94	38	256	2	3
Portugal	397	636	44	36	2	2

[a]Average of six towns included per country

the households living in (often) more remote locations in the hinterland (H-HH) (Courtney et al. 2007). However, it is not really clear to what extent this is still the case, and for which activities and services this holds in particular. Therefore, we first look at the supply of shops, then at the spatial distribution of households' purchases in general, and, finally, we focus on different products and services.

3.2.1.1 Supply of Shops

Shopping behaviour is largely influenced by the availability and accessibility of retail businesses (see also Sect. 3.4.1 of this chapter). Table 3.1 shows the average figures for the number of shops in town (zone A) and hinterland (zone B), the number of inhabitants per shop, and the number of employees per shop (which indirectly indicates the average size of the shops).

It appears that, in England, the number of shops in town (zone A) and especially in the hinterland is relatively low. However, at the same time the number of employees per shop is quite high. This indicates that the shops are larger. In Portugal, on the other hand, a great number of shops are located in both town and hinterland. But, the shops are smaller, with on average two employees per shop, and each serves only around 40 inhabitants. Nevertheless, as shown below, in Fig. 3.1, this results (on average) in a relatively high share of purchases in town by all households and a large share of purchases in the hinterland by H-HH. In Poland, the number of shops in town is also high, resulting in a large share of purchases there. However, in the hinterland there, the number of shops is smaller and the number of inhabitants per shop much higher.

3.2.1.2 Location of Purchases

Figure 3.1 shows the average distribution of household purchases over different zones; zone A (town), zone B (hinterland, 7 km zone), zone C (extended hinterland, 16 km zone), and the ROW (the rest of the world). It appears that, in all countries, the towns are the most important places for shopping. Especially the Portuguese and Polish T-HH do most of their shopping in town and only a relatively small part

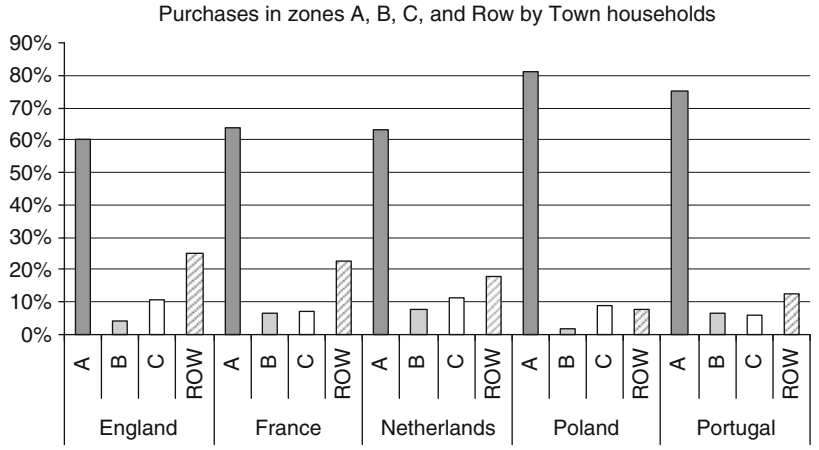

Fig. 3.1 Average share of purchases in zones A, B, C, and Row by Town households (T-HH)

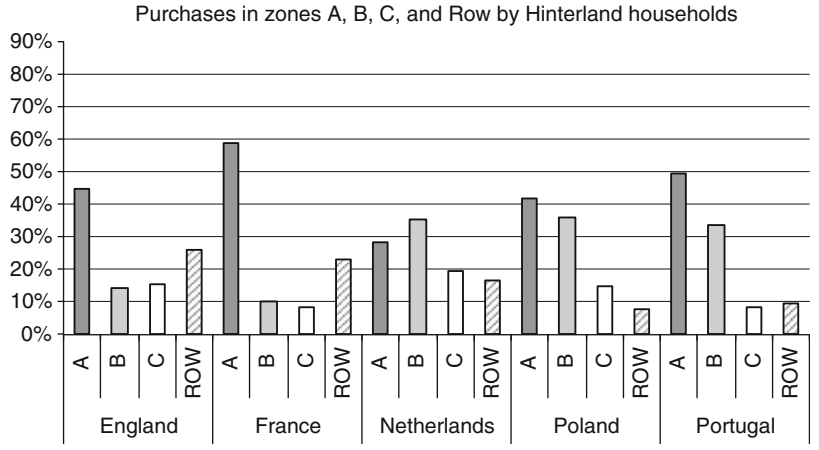

Fig. 3.2 Average share of purchases in zones A, B, C, and Row by Hinterland households (H-HH)

in the ROW. English T-HH, on the other hand, purchase the smallest part in town, but, this is still, on average, 60%. Instead, around a quarter of total expenditures are spent in the ROW.

Figure 3.2 shows the distribution of purchases of H-HH. In almost all countries (except in the Netherlands), the H-HH too buy most goods and services in town. In France, H-HH buy only 10% of their consumption in the hinterland itself. Instead, these households go to town for their shopping: almost 60% of all purchases are bought there (comparable to the share of T-HH). This is probably because there are only a small number of shops in the French hinterland. In England as well, only 12% of the purchases of H-HH is done in the hinterland. Just like the English T-HH,

Table 3.2 Share of income spent on purchases of different products and services bought in town (zone A) or hinterland (zone B) by town and hinterland households

Purchases of products and services	Zone	Town households					Hinterland households				
		E	F	NL	Pl	PT	E	F	NL	Pl	PT
Food or groceries	A	**0.79**	**0.80**	**0.90**	**0.86**	**0.79**	**0.63**	**0.69**	0.38	0.38	0.47
	B	0.04	0.06	0.06	0.02	0.09	0.11	0.11	**0.46**	**0.44**	**0.40**
Pharmaceuticals	A	**0.86**	**0.90**	**0.92**	**0.97**	**0.94**	**0.70**	**0.73**	0.41	**0.62**	**0.64**
	B	0.04	0.06	0.03	0.01	0.03	0.12	0.17	**0.47**	0.20	0.32
Clothing and footwear	A	0.27	**0.46**	**0.48**	**0.64**	**0.58**	0.27	**0.49**	0.29	**0.47**	**0.55**
	B	0.03	0.04	0.08	0.03	0.04	0.06	0.08	0.26	0.09	0.15
Furniture	A	0.24	0.26	0.24	**0.45**	**0.66**	0.18	0.24	0.09	0.27	**0.37**
	B	0.01	0.02	0.09	0.03	0.05	0.04	0.00	**0.28**	0.07	0.17
Hairdressing/beauty treatment	A	**0.80**	**0.86**	**0.86**	**0.93**	**0.92**	**0.64**	**0.60**	0.31	0.41	**0.57**
	B	0.06	0.04	0.06	0.02	0.04	0.18	0.19	**0.45**	**0.43**	0.37
Takeaway food	A	**0.86**	0.34	**0.91**	**0.89**	**0.94**	**0.73**	0.29	0.33	**0.52**	**0.57**
	B	0.02	0.06	0.03	0.02	0.03	0.10	0.11	**0.49**	0.09	0.37
Domestic help and childcare	A	**0.86**	**0.75**	**0.90**	**1.00**	**0.79**	**0.56**	**0.79**	0.20	0.35	0.37
	B	0.04	0.19	0.08	0.00	0.18	0.27	0.21	**0.67**	**0.56**	**0.56**
Medical/dentistry	A	**0.67**	**0.75**	**0.80**	**0.86**	**0.75**	**0.53**	**0.73**	0.32	**0.49**	**0.59**
	B	0.04	0.09	0.06	0.03	0.05	0.12	0.11	**0.48**	0.20	0.19
Restaurant/pub food and drinks	A	0.44	0.48	0.47	**0.58**	**0.80**	0.28	0.33	0.20	0.29	**0.47**
	B	0.10	0.07	0.08	0.02	0.05	0.24	0.19	**0.31**	0.21	**0.35**
Education/training	A	**0.66**	**0.58**	**0.46**	**0.52**	**0.47**	0.32	**0.56**	0.27	0.25	0.33
	B	0.05	0.10	0.06	0.01	0.05	0.17	0.14	**0.23**	**0.27**	0.19
Cinema and theatre	A	0.19	**0.48**	0.12	0.22	**0.47**	0.16	**0.47**	0.05	0.14	**0.44**
	B	0.04	0.04	0.08	0.04	0.02	0.06	0.09	0.10	0.05	0.05

Relatively high shares of income are printed in bold

the English H-HH buy a relatively large share in the ROW (around 25%), as well as 45% in town.

In the other three countries, around one-third of the purchases are bought in the hinterland. The Netherlands is the only country in which the H-HH make more purchases in the hinterland itself than in town; furthermore, they buy a relatively large share in zone C. Here, the purchases are more evenly spread over the four zones.

Apparently, in England and France, there is little difference between town and hinterland households; for both groups, the town is the most important place to buy goods and services. But, in the Netherlands, Poland and Portugal, the hinterland is an important place of shopping facilities for H-HH as well.

3.2.1.3 Focusing on Different Products and Services

In most European households, expenditures on food and groceries still take an important part of the budget: on average around a third. Furthermore, a relatively large amount of their income is spent on clothes and footwear, fuel and vehicle repairs and servicing (not shown in Table 3.2).

Table 3.2 shows the relative importance of the town (zone A) and hinterland (zone B) as a place to obtain certain products and services. First of all, it appears

that we can distinguish three groups of products which are mostly bought close to the place of residence, both by T-HH and by H-HH. These are food and groceries, domestic help and childcare, as well as hairdressing and beauty care. This is particularly true in the Netherlands, Poland and Portugal.

According to Satterthwaite and Tacoli (2003), access to services such as health care and education are an important aspect of rural-urban linkages, with services often located in towns, which also serve the population of surrounding rural areas. This is in line with our findings. In all countries, the town is the place where both T-HH and H-HH buy most of their pharmaceutical products; for T-HH this is on average more than 90% and for H-HH more than 60%. Households also tend to go to town for medical care and dentistry. Only in the Netherlands are these facilities found in the hinterland as well.

As we can see, towns (zone A) also still remain places where both T-HH and H-HH buy a significant part (about half) of their clothes and shoes, and where part of the education is offered, especially for T-HH. Furthermore, in Portugal and Poland most of the furniture is bought in town by T-HH, while in the other countries (just) around a quarter of the furniture budget is spent there. However, in general, clothes, furniture and education, together with cinema and theatre, are the products and services least bought in town.

Finally, it is noteworthy that the local area can also be a place for entertainment and fun: French and Portuguese households go to the town to visit the cinema or theatre. Furthermore, in all countries T-HH often go to town for restaurants and pubs. The English T-HH manage to spend 10% of their pub expenditures in the hinterland and H-HH even 24%, which makes this the most important function of the English hinterland.

To summarize, it appears that towns are important places for shopping: between 60 and 80% of T-HH total purchases and between 40 and 60% of H-HH total purchases are bought in town. Only in the Netherlands do H-HH buy more in the hinterland. When focusing on different goods and services, it appears that, in general, food and groceries, domestic help and childcare, as well as hairdressing and beauty care are products mostly bought in the zone of residence. In all countries, the town is especially the place where both T-HH and H-HH buy most of their pharmaceutical products as well as their medical care and dentistry.

Considering national differences, we found that especially in Portugal and Poland the towns are very important for T-HH, for most kinds of products and services. In England and France the towns are relatively important for H-HH. The Dutch H-HH use facilities in both zones.

3.2.2 Towns as a Place to Work

Commuting behaviour is closely related to behavioural patterns in the labour and housing market, since the commuting journey allows persons to link their work-place spatially to their residential location (van Ommeren et al. 1999). In England

and Wales, for example, a tendency for the de-concentration of populations and jobs, as well as an increase in commuting distances is observed, together with a preference for combining rural living with taking advantage of the specialized jobs and services located in urban areas (Nielsen and Hovgesen 2008). However, not much information is available about national differences in commuting distances. From the national statistics bureaus of the Netherlands and the United Kingdom, we know that the average commuting distance for households in medium-sized towns is 17 km in the Netherlands and 15 km in the UK, which corresponds with zone C in our analysis. Factors affecting this distance are, amongst others, the availability of jobs and accessibility (travel time) (see also Titheridge and Hall 2006).

3.2.2.1 Supply of Jobs

Table 3.3 shows the (average) number of available jobs in town and hinterland per country, and the number of jobs available per household. According to this table, the availability of jobs in Poland and Portugal is much higher compared with the availability in England, France and the Netherlands. Particularly in France, the number of jobs in the hinterland is very low.

3.2.2.2 Location of Jobs of Local Households

This high availability of jobs in Poland and Portugal results in a relatively large share of T-HH with a job in town, as shown in Fig. 3.3. In these two countries, in particular the share of households with a job in zone C and even further away, is relatively low, while in the other three countries this share is more than 60%.

Although the average number of jobs in the French hinterland is relatively low, quite a large group (around 25%) of T-HH have a job there. In general, most employed T-HH have a job in town. Only in the Netherlands is this group just 42% of all employed households.

For the English and French H-HH, the town is also an important location for work (see Fig. 3.4). Particularly in France, more H-HH have a job in town than in the hinterland. In the other three countries, most H-HH work in the hinterland itself.

Table 3.3 Availability of jobs in Zone A (town) and zone B (hinterland)

	#Jobs		Jobs/household	
	Zone A	Zone B	Zone A	Zone B
England	3,367	5,648	0.8	1.0
France	4,858	2,758	1.0	0.6
Netherlands	4,641	11,108	0.9	0.9
Poland	4,667	4,094	1.5	1.9
Portugal	6,198	10,159	1.8	1.5

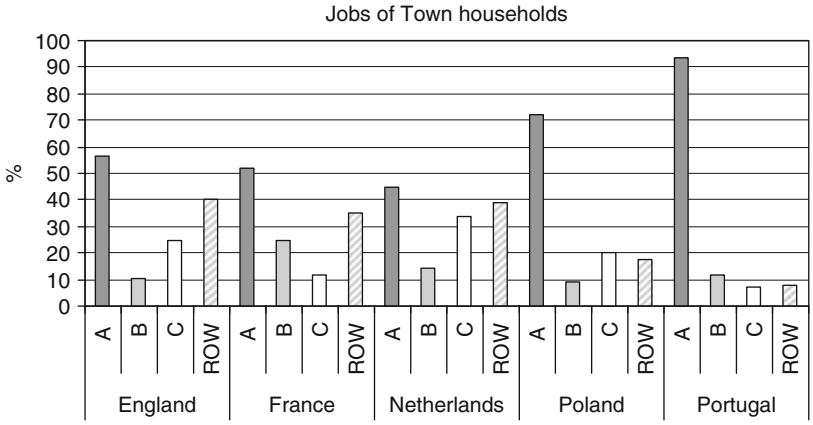

Fig. 3.3 Share of employed town households with a job in zones A, B, C or the ROW

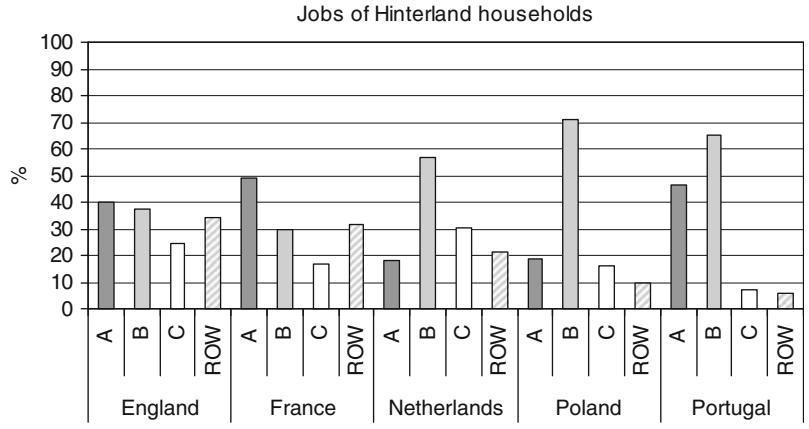

Fig. 3.4 Share of employed hinterland households with a job in zones A, B, C or the ROW

3.2.2.3 Kind of Occupation and Job Location of Local Households

For the town and hinterland households, in general, the government is the most important employer; only in Poland do most households have a job in the agricultural sector. Other important sectors are construction and retail (see Table 3.4).

Households with a job in town most often have a job in the public administration sector. In addition, in France and Poland manufacturing is also an important sector (around 20%). In the immediate hinterland, zone B, the agricultural sector still offers a very significant number of jobs; around 50% in France, the Netherlands and Portugal, and even 74% of the households in Poland. When households are employed in zone C, this is mostly in the public administration sector or in other services sectors.

Table 3.4 Distribution of jobs over the most important sectors per zone (both T-HH and H-HH)

Area	Country	England (n = 1,395)	France (n = 993)	Netherlands (n = 1,702)	Poland (n = 1740)	Portugal (n = 1,899)
	Sector			%		
Zone A	Agriculture	8	16	12	5	3
	Manufacturing	11	20	7	21	1
	Construction	8	3	8	8	5
	Retail	15	8	14	11	9
	Public adm.	30	34	30	34	74
	Other services	28	19	29	21	8
Zone B	Agriculture	38	52	45	74	56
	Manufacturing	11	16	11	6	6
	Construction	9	1	5	3	6
	Retail	7	8	1	3	4
	Public adm.	17	18	24	7	25
	Other services	18	5	14	7	3
Zone C	Agriculture	8	15	15	10	0
	Manufacturing	13	34	20	19	20
	Construction	11	5	6	7	14
	Retail	4	6	7	5	12
	Public adm.	28	25	37	24	34
	Other services	36	15	15	35	20
Total	Agriculture	12	21	21	39	19
	Manufacturing	12	23	9	14	4
	Construction	10	4	7	5	6
	Retail	10	5	7	6	7
	Public adm.	27	28	31	19	56
	Other services	29	19	25	17	8

3.2.3 Towns as a Place to Live

In the Netherlands, around 20% of the population live in small or medium-sized towns. In the rest of Europe as well, these kinds of towns form an important component in the settlement structure.

Many persons live most of their life in the same town, as shown in Table 3.5. Particularly in Poland and Portugal, and to a lesser extent in the Netherlands, most households have a long relationship with their place of residence.

To see whether there are many households which only use the town or hinterland as a place to live, without having a job or doing most of their shopping nearby, Table 3.6 shows the percentage of T-HH without a job in town, and which do less than 30%[1] of their shopping in town, and the percentage of households which neither work nor shop in town. The last column shows to what extent the households that are not attached to the town, work or shop in the hinterland (zone B).

[1]On average, 70% of T-HH purchases are bought in town, and 30% of H-HH purchases are bought in the hinterland.

Table 3.5 Share of households that have lived their whole life, or more than 30 years, in the same place

	Town households	Hinterland households
England	0.39	0.43
France	0.48	0.51
Netherlands	0.58	0.70
Poland	0.72	0.78
Portugal	0.69	0.78

Table 3.6 Percentage of town households that are not attached to the town

Town households	No job in A (%)	No[a] shopping in zone A (%)	Not working or shopping in zone A (%)	Job or shopping in zone B(%)[b]
England	68	19	15	24
France	63	15	11	47
Netherlands	71	11	8	46
Poland	47	5	2	29
Portugal	9	7	3	94

[a]Less than 30% of total purchases in town
[b]Percentage of town households that are not attached to the town but which have a job or shop in the hinterland

Table 3.7 Percentage of hinterland households that are not attached to the hinterland (zone B)

Hinterland households	No job in B (%)	No[a] shopping in zone B (%)	Not working or shopping in zone B (%)	Job or shopping in zone A[b] (%)
England	75	84	64	74
France	77	89	69	91
Netherlands	51	51	31	72
Poland	44	52	26	79
Portugal	36	56	28	99

[a]Less than 30% of total purchases in hinterland
[b]Percentage of H-HH that are not attached to the hinterland but which have a job or shop in town

It appears that, particularly in England and France, a more substantial part of the population (15 and 11% of the households) neither have a job nor shop in town: they only live there. In England, most of these households are elderly; in France, most are couples with children. In Poland and Portugal too, most households not attached to the town are couples with children. In the Netherlands, the situation is slightly different with both the elderly and couples with no children being the households that are less attached to the town.

In some cases, T-HH are more attached to the hinterland. This holds in particular for households in France, the Netherlands and Portugal, where 47, 46 and 94% of the T-HH that are not attached to the town go to work or shop in the hinterland.

More than in a town, H-HH only use their immediate surroundings to live there, as is shown in Table 3.7. This holds for almost 70% of the H-HH in England and France, and for around 30% of those households in the other three

countries. This is a significant difference. In all countries, the households least attached to the hinterland are households with children. Instead, these households in particular have a job or shop in town, pointing to the importance of towns for H-HH.

Overall, we can conclude that towns are still important places for facilities and jobs for local households. Of the T-HH, only between 2 and 15% do not shop or have no job in town. Of the H-HH, between 26 and 69% do not shop or have no job in the hinterland. For most of these H-HH the town has a central function for shopping or working. The strongest national differences found are related to H-HH. However, in all countries, the towns with their facilities and jobs are also important to H-HH.

3.3 Regression Analysis of Purchases Bought in Town and Hinterland

In the former section, it became clear that the national differences of spatial behaviour of T-HH are much smaller than of H-HH. A possible reason for this could be that the spatial characteristics of the hinterland zones are more distinctive, such as the available number of shops or jobs. Therefore, we now perform a linear regression analysis (OLS) to see which household characteristics and which spatial characteristics of the local area affect the distribution of household purchases over town and hinterland (in all 30 towns). For the regression analysis, individual household data are used, and a distinction is made between T-HH shopping in town (zone A), H-HH shopping in town, and H-HH households shopping in the hinterland (zone B). Because in most towns the share of purchases of T-HH in the hinterland is very small, it was not possible to run a regression analysis for this situation.

The regression results shown in Table 3.8 indicate that both family characteristics and town characteristics affect the spatial shopping behaviour of households.

Concerning the family characteristics, the place of work is important; households with a job in town buy a larger share of their products there, while households with a job in zone B or C buy less in the town and more in other regions. Of course, a person is more likely to do his/her shopping in town when he/she is also working there. Possibly, these persons are more ‘connected’ to the town. Just as it is for the persons who have lived for a long time in the region, the coefficient for all households is positive significant (also for the H-HH shopping in zone A), but the highest coefficient is for T-HH shopping in their own town.

Car-ownership is related to a lower share of purchases in the ‘home’-region and it is positively correlated with purchases of H-HH in the town. Not surprisingly, the car can be used to shop somewhere else. In addition, households with a relatively high income also tend to buy less in town or hinterland. The kind of household, such as its size or composition, has less impact than expected.

Table 3.8 OLS regression exploring the determinants of local orientation in shopping behaviour

Explanatory variables	Share of all purchases bought in zone A				Share of all purchases bought in zone B	
	Town households (A)		Hinterland households (B)		Hinterland households (B)	
	Stand. Coeff.	t-ratio	Stand. Coeff.	t-ratio	Stand. Coeff.	t-ratio
(Constant)	7.652	1.686	**−37.832**	−6.319	**35.097**	6.717
Family size (ln)	**0.063**	3.575	−**0**.008	−0.478	0.021	1.214
Household income	**−0.092**	−5.631	**−0.048**	−2.863	−0.018	−1.073
Number of years living in the area (ln)	**0.107**	6.791	**0.051**	3.165	**0.045**	2.835
Number of vehicles owned	**−0.163**	−9.260	0.030	1.693	**−0.064**	−3.677
# Jobs zone A	0.025	1.390	**0.246**	13.691	**−0.211**	−11.871
# Jobs zone B	**−0.102**	−6.478	**−0.054**	−2.850	**0.063**	3.362
# Jobs zone C	**−0.033**	−2.056	**−0.098**	−5.836	**−0.053**	−3.183
Distance closest city of 50,000 (ln)	**0.110**	6.453	**0.224**	12.742	**−0.264**	−15.164
Highway in zone A	**−0.058**	−3.196	0.017	0.920	−0.001	−0.062
Highway in zone B	**−0.052**	−2.414	**0.091**	4.041	−0.037	−1.666
Highway in zone C	**−0.110**	−6.433	**−0.037**	−2.183	**−0.034**	−2.012
Shops zone A (ln)	**0.252**	10.864	**0.267**	11.383	0.031	1.342
Shops zone B (ln)	−0.035	−1.575	**−0.288**	−13.442	**0.308**	14.518
Adj. R^2	0.218		0.265		0.285	
F-value	74.739		89.328		97.88	

The coefficients printed in bold are significant at the 0.05% level

From the (spatial) town characteristics, we choose those characteristics which are relevant for the shopping behaviour of households. These are the number of shops; the distance to the closest city of 50,000 inhabitants; and the presence of a highway exit in zone A or B.

When looking at the town characteristics, it appears that the distance to the nearest city of 50,000 inhabitants and the number of shops are particularly important. The further away the city is, the larger the share of purchases in town but the lower the share of purchases in the hinterland. This last result is slightly difficult to explain, but it could be possible that a larger distance to the city is related to a higher level of rurality and thus to less facilities in the hinterland.

The number of shops in town positively affects the share of purchases there, both from T-HH and from H-HH. It does not negatively affect the share of H-HH purchases in the hinterland. On the other hand, the number of shops in the hinterland does have a negative effect on the purchases of T-HH (not significant) and H-HH in town.

Finally, it appears that the presence of a highway exit in zone A makes it easier for T-HH to shop somewhere else; it decreases their share of purchases in town. However, it does not seem to affect the behaviour of H-HH. An exit in zone C has a negative effect on the local purchases of both T-HH and H-HH.

The regression analysis showed clearly that both the characteristics of the family and the spatial characteristics of the area affect the share of purchases bought in town or hinterland. Of the household characteristics, particularly the level of income, car-ownership, and the place of work affect the shopping behaviour of households. Important spatial characteristics are distance to the nearest city of 50,000 inhabitants, as well as the availability of shops.

3.4 Spatial Shopping Behaviour of Dutch Households

3.4.1 Factors Affecting the Destination Choice of Households for Shopping

The regression analysis showed that both household characteristics and spatial characteristics affect the share of purchases bought in the local area. But how exactly do these features affect the choice of households to shop more at one location than at the other? And does this choice differ between different kind of goods and services?

Households can have different reasons for shopping, for which different kinds of shopping locations are most suitable. In general, shopping visits to town centres are made for reasons of pleasure, whereas the use of peripheral centres for shopping purposes is more frequently explained by economic motives (Gorter et al. 2003).

Different kinds of shopping can also be categorized as run, fun and goal shopping (Gorter et al. 2003; Evers et al. 2005). Run shopping is supposed to be an efficient activity in which particular, predetermined (everyday) goods are to be bought as quickly as possible (for example, after working hours on the trip from work to home). This kind of shopping activity may take place at the fringe of the city, or in smaller shopping centres close to the place of residence. In contrast, fun shopping is associated with visits to several (comparable) shops for pleasure and socializing. This kind of shopping is more dependent on hedonistic influences, such as style, recreational activities and social pressures (Schenk et al. 2007). This is most likely to take place in concentrated city centres in which there is a wide variety of shops and goods, as well as many opportunities for leisure. Finally, goal shopping also deals with predetermined purchases but includes shopping for do-it-yourself products or for plant and garden products. Like run-shopping, this kind of shopping is also supposed to be efficient but not on a daily basis. It may predominantly take place at the fringe of the city.

Although in a number of studies it is argued that many shopping trips are multi-purpose trips, which means that the purchase of different goods and services is combined (see Arentze et al. 1993; Oppewal and Holyoake 2004), Popkowski et al. (2004) showed that in general grocery shopping is not part of multi-purpose shopping, possibly because groceries need refrigeration. Therefore, to our opinion, a broad distinction between grocery-, fun- and goal shopping is justifiable.

In this section, we first take a closer look at the main socio-economic and location factors that affect the spatial shopping behaviour of households revealed by both a literature survey and the regression analysis. We then take a brief look at the characteristics of the Dutch households concerning these factors. Only the Dutch households are included because in-depth information about the spatial characteristics of the local area in other countries is unfortunately not available (see Fig. 3.5 for the location of the towns). We focus on the three described kinds of shopping: grocery or run shopping; fun shopping (like shopping for clothes, shoes, and different kind of luxuries, etc.); and goal shopping (shopping for furniture, gardening products, do-it-yourself products, etc.).

Fig. 3.5 The location of the six Dutch case-study towns

3.4.1.1 Socio-Economic Factors

In the literature about the spatial shopping behaviour of households, often a distinction is made between inshopping (e.g. in town) and outshopping (e.g. out of town). According to Miller and Kean (1997), it is not necessarily true that factors affecting inshopping are the same as those affecting outshopping, thus clarifying dissimilarities between some studies. In most outshopping studies, for example, a higher level of income seems to be related to a higher share of purchases outside town (Herman and Beik 1968; Papadopoulos 1980). Nevertheless, when focusing on inshopping, there seems to be no significant income effect (Pinkerton et al. 1995; Miller and Kean 1997).

Another important socio-economic factor is age. It is often stated that older persons are less mobile and therefore are more likely to shop close to their place of residence (see Pinkerton et al. 1995, Powe and Shaw 2004; Papadopoulus 1980). They are also supposed to be more attached to the local area. However, attachment can also be measured by length of residence (see Brown 1993) or satisfaction with the community.

A final interesting socio-economic factor is the family situation, such as whether a family has young children. Herman and Beik (1968) and Miller and Kean (1997) found that households with young children tend to do less outshopping (or more inshopping).

3.4.1.2 Location Factors

Besides these socio-economic factors, location factors also affect the shopping behaviour of households. First of all, a destination has to be in reach of a consumer. This means that the distance to a shopping facility is important. Distance can be measured in many different ways such as in a straight line, by road, or in a cognitive way (see Cadwallader 1975). Nevertheless, for all kinds of distances it holds that the further away a facility, the less likely a consumer will go there. Another important location factor is the attractiveness of the destination. This attractiveness can be measured in many different ways, such as by the accessibility of the destination, quality of service, or the supply of products. Gorter et al. (2003), for example, use the quality of parking facilities and the atmosphere in shops. Another variable often used when working on a more regional level rather than on the level of single shops is the available floor space. According to Schenk et al. (2007), both price and assortment characteristics are very closely related to the size of the store.

A final important variable, which can be considered as both a location and a socio-economic variable, is the place of work of the consumer. As Papadopoulos (1980:57) described, sometimes consumers would not consider travelling a longer distance for their shopping; but once a consumer reaches a larger trade centre, for whatever other reason (such as work), shopping appears to become a significant secondary activity.

3.4.2 Characteristics of Dutch Town and Hinterland Households

Table 3.9 shows the socio-economic characteristics which are relevant to the shopping behaviour of the households included in the analysis. First of all, most of them own one or more vehicles,[2] especially in the hinterland (96%). As well as that, it shows that the average age of the head of household is around 50 years (slightly higher in the towns) and the average length of residence 36 years, which seems to be fairly high. The average income of town households seems to be slightly higher than the income of hinterland households. As we used national 10% income groups (1–10), it is expected that the averages lay around 5. Furthermore, it appears that a larger share of households living in the hinterland are families with children under 17 years of age. Finally, around a quarter of the persons with a job (maximum of two jobs per household) work in zone C, almost half of the hinterland households work in the hinterland[3] and 35% of the town households have a job in town.

Table 3.10 shows the shopping behaviour of households for different groups of products: grocery shopping; fun shopping (shopping for clothes, shoes, and different kinds of luxuries, etc.); and goal shopping (shopping for furniture, gardening products, do-it-yourself products, etc.). As was also shown in Sect. 3.2, households living in the towns buy most of their products locally: half of the fun purchases are bought in town and as much as 90% of all groceries. Households do not often visit the hinterland (zone B) for shopping, but around 15% of fun shopping and goal shopping is done in zone C.

The hinterland households, on the other hand, do visit the town for their purchases: around one-third of all their products is purchased in town. This

Table 3.9 Socio-economic characteristics of households in the database

Characteristic	Residential zone	
	Town	Hinterland
Owning one or more vehicles	88%	96%
Average age head of household	53	48
Average length of residence	35	37
Average income[a]	5.2	5.0
Households with children (<17 years of age)	25%	35%
Job in Town[b]	35%	15%
Job in Hinterland[b]	11%	46%
Job in zone C[b]	26%	23%

[a]We used 10% income groups (1–10)
[b]As a share from all persons with a job

[2]These vehicles are mostly cars.

[3]This share is fairly high because of a relatively large group of farmers in the database, who most of the time work close to their residence.

Table 3.10 Average share of purchases bought in zones A, B, C, or D for different kind of product groups

Residential zone	Kind of purchases	Location of shop			
		Zone A	Zone B	Zone C	Zone D
Town (Zone A)	Grocery	90	6	3	1
	Fun	49	8	15	38
	Goal	72	8	12	8
	Average	74	7	8	11
Hinterland (Zone B)	Grocery	38	46	15	1
	Fun	27	27	24	22
	Goal	33	41	20	6
	Average	33	40	19	8

means that the town has a supra-local function, even for groceries which are products often bought nearby (in the zone of residence). At the same time, 40% of H-HH shopping took place in the hinterland itself, and 19% in zone C. As expected, especially everyday products are bought in the zone of residence of the households.

3.4.3 Multinomial Logit Model of Spatial Shopping Behaviour (MNL)

In order to analyse the impact of a set of relevant variables on the revealed location choice of households (as shown in Table 3.10), we use a multinomial logit model (MNL model). An MNL model consists of utility functions related to the choice of a set of alternatives. The utility function assumes that rational consumers always maximize their own utility (Hensher et al. 2005). In such a function (U_i), the preferences of consumers for certain characteristics of the alternatives are included, together with an non-observable (error) term (ε_i). Our model estimates the utility (benefit) of households for shopping in zones A (town), B (hinterland), C (16 km zone) or D (the ROW).

Therefore, we developed four utility functions:

$$U_i(A) = \alpha\ \mathrm{lndist}_{iA} + \beta\ \mathrm{lnfloor}_{iA} + \gamma \mathrm{job}_{iA} + \delta(\mathrm{lndist}_{iA} * \mathrm{car}_i) + \theta(\mathrm{age}_i * \mathrm{lndist}_{iA}) + \iota\ \mathrm{lnyear}_i + \varepsilon_{iA};$$

$$U_i(B) = \alpha\ \mathrm{lndist}_{iB} + \beta\ \mathrm{lnfloor}_{iB} + \gamma \mathrm{job}_{iB} + \delta(\mathrm{lndis}_{iB} * \mathrm{car}_i) + \theta(\mathrm{age}_i * \mathrm{lndist}_{iB}) + \iota\ \mathrm{lnyear}_i + \varepsilon_{iB};$$

$$U_i(C) = \alpha\ \mathrm{lndist}_{iC} + \beta\ \mathrm{lnfloor}_{iC} + \gamma \mathrm{job}_{iC} + \delta(\mathrm{lndist}_{iC} * \mathrm{car}_i) + \theta(\mathrm{age}_i * \mathrm{lndist}_{iC}) + \iota(0) + \varepsilon_{iC};$$

$$U_i(D) = \gamma\ job_{iD} + \zeta\ income_i + \eta(kids_i) + \kappa\ Oudewater_i + \lambda\ Gemert_i + \mu\ Dalfsen_i + \nu\ Nunspeet_i + \xi\ Schagen_i + o\ Bolsward_i + \varepsilon_{iD.}$$

Important variables in the utility functions dealing with zones A, B and C are: distance to the zone[4]; floor space in the zone[5]; job in the zone; having a car (related to distance); age of head of household (related to distance), and the length of residence in the area (zone A and B). In the utility function of ROW (zone D), having a job there is included, as well as the level of income of the households; having children or not; and a dummy variable for each town. Because the utility of a household to shop in zones A, B, C, and D depends on the kind of shopping, we ran this model three times; for groceries, fun shopping, and goal shopping.

With help of the four utility functions we can calculate the probability that household i will shop in each of the above-mentioned zones. We do this by comparing the utility of, for example, zone A to the utility of all four zones. So what we calculate is the probability that household i shops in a certain zone when taking into account the utility of shopping in the other zones as well.

3.4.4 Results of the Multinomial Logit Model

Table 3.11 shows the results from the MNL analyses. Because we are interested in the general importance of the variables used in the utility functions of zones A, B and C, we included general parameters. This means that we do not have separate parameters, with different values for, for example, distance to zone A, zone B, or zone C, but that we have one parameter for all three.

As expected, the distance variable appears to have a significant negative impact on the utility: the further away a shop, the less likely (less utility) a household will visit it. This holds particularly for groceries and goal shopping and less for fun-shopping. When households go shopping for fun, the distance is less important.

Of course, the supply of products is also important. Therefore, floor space is included in the model. This variable has a significant positive effect on the utility. The parameter has a higher value for everyday purchases and a lower value for fun or goal shopping.

Besides these spatial variables, a set of socio-economic variables has also been added. First of all, the place of work is important: when a member of the household has a job in the zone concerned, it is more likely he or she will do

[4]Distance to the nearest place with a shop of considerable size in the zone concerned. For grocery shopping a shop of considerable size was set at a floor space of 60 m^2, and for fun and goal shopping it was 160 m^2.

[5]That is, floor space of shops in the nearest place with a shop of considerable size in the zone concerned.

Table 3.11 Results from the multinomial logit analyses to derive the utility from shopping in zone A, B, C or D

Explanatory variables	Groceries (Radj.0.60)		Fun (Radj.0.13)		Goal (Radj.0.30)	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
lnDIST	−1.34[a]	−5.561	−0.65[a]	−3.302	−1.15[a]	−4.034
lnFLOOR	0.59[a]	11.474	0.37[a]	7.919	0.28[a]	5.334
JOB	0.50[a]	4.418	0.18[b]	2.224	0.40[a]	4.256
CAR[c]lndist	0.08	0.460	0.08	0.570	0.47[b]	2.130
AGE[c]lndist	0.002	5.842	−0.007	−0.293	−0.001	−0.389
lnYEAR	0.26[a]	0.508	0.02	0.518	0.07[c]	1.721
INCOME	0.08	0.715	0.14[a]	4.522	0.10[b]	2.105
KIDS	−0.13	−0.187	−0.44[b]	−2.414	0.33[c]	1.849
Oudewater	0.24	0.240	1.73[a]	3.294	−0.43	−0.650
Gemert	0.51	0.489	1.87[a]	3.491	−0.34	−0.483
Nunspeet	0.09	0.080	2.03[a]	3.652	−0.38	−0.539
Schagen	−0.31	−0.269	0.82	1.483	−0.51	−0.730
Bolsward	−0.21	−0.200	1.83[a]	3.487	−0.12	−0.185

Because of data difficulties we had to exclude Dalfsen from this analysis
[a]Significant at the 0.01 level
[b]Significant at the 0.05 level
[c]Significant at the 0.1 level

some shopping there as well. Furthermore, owning a car reduces the distance sensitivity of shopping. However, this variable (dummy for owning one or more cars multiplied by the (ln) distance) is only significant for goal shopping. For this kind of shopping it is plausible that owning a car makes it easier to go further away; goal shops are often located outside city/town centres, and the products bought can be relatively heavy and large, so that public transport is a less attractive mode. It could be expected that owning a car would also be significant for the distance sensitivity for fun shopping. However, it is often difficult to park in a city or town centre and most of these locations are easy to reach by public transport in the Netherlands.

In line with the literature (e.g. Pinkerton et al. 1995; Powe and Shaw 2004; Papadopoulus 1980), it was expected that the age variable would be positive significant as well. Many studies have found that older people tend to buy their products more locally. We checked this by adding a distance component to see whether the elderly have a stronger distance sensitivity. Unexpectedly, it appears that the effect is very small and not significant.

This has partly to do with the last variable included in the utility functions of zones A, B, and C: the length of residence in zone A or B. This variable is not often added to these kind of models simply because this information is often not available. When the length of residence is added (e.g. Powe and Shaw 2004; Miller and Kean 1997), the sign is positive for inshopping. In our model too, it is (strongly) positive significant for buying groceries, and to a lesser extent for goal shopping. This means that the longer a household lives in zone A or B, the more utility it has from shopping there. In the articles cited above, the authors do not include length

of residence together with an age variable, so we do not know the interaction effect.[6] Of course, many older persons do tend to have lived for a long time in zones A and B.[7]

The second half of the table shows the variables included in the utility function for shopping in the ROW (zone D). Zone D typically represents shopping opportunities in large cities far away from the (rural) town. Since we did not have access to data on the supply of shops at this scale, we decided to represent the utility of this long-distance opportunity by means of destination-specific dummies, the work location dummy, plus some household-specific dummies. Households with a higher income seem to have a higher utility from shopping in zone D, especially related to fun shopping. This is in line with what was expected from the literature, as well as from the regression analysis. On the other hand, households with children are less likely to go to zone D for fun shopping. Strangely enough, the parameter for goal shopping (by households with children in zone D) is positive. Possibly these households need more specific products (e.g. to decorate children's rooms). Finally, five town dummies are added. These are not significant for groceries or goal shopping. However, for fun shopping all five dummies are significant, which is no surprise, given the high values for zone D in Table 3.10.

From the MNL analysis it appears that particularly the location factors are very important for the spatial shopping behaviour of Dutch households. As expected, the utility functions have different parameter values for the three different kinds of shopping. The general location factors, such as distance and floor space, are important for all kinds of shopping, but mostly for grocery shopping. The town-specific dummies, related to shopping in the ROW (zone D), are only relevant for fun shopping.

Of the socio-economic factors, the place of work is the only variable which is significant for all three kinds of shopping. The length of residence is particularly relevant for grocery shopping, level of income for fun shopping, and car ownership for goal shopping.

3.5 Summary and Conclusions

In this chapter, we have focused on towns as a place to live, work, and shop. Not many publications are available which focus on these three subjects simultaneously.

[6]Brown (1993) looked at rural community satisfaction and attachment in mass consumer society, and found that community satisfaction is primarily affected by length of residence. In this analysis he also included age, which was not significant. In many studies, community satisfaction is seen as an important variable for inshopping (e.g. Pinkerton et al. 1995). However, Brown did not find a significant relationship with inshopping.

[7]However, the bivariate-correlation is only 0.47.

First of all, towns are an important place for shopping: between 60 and 80% of T-HH total purchases and between 40 and 60% of H-HH total purchases are bought in town. Only in the Netherlands do H-HH buy more in the hinterland. In all countries, the town is especially the place where both T-HH and H-HH buy most of their pharmaceutical products, as well as their medical care and dentistry. Goods and services like food and groceries, domestic help and childcare, as well as hairdressing and beautycare appear to be mostly obtained at a short distance, in the zone of residence (either town or hinterland).

Secondly, in all countries, the towns are the most important place of work for households living there (T-HH). In addition, the towns are also an important location of work for the English and the French H-HH. Particularly in France, more H-HH have a job in town than in the hinterland. In the other three countries, most H-HH work in the hinterland itself.

For the T-HH and H-HH in general, the government is the most important employer; only in Poland do more households have a job in the agricultural sector. Other important sectors are construction and retail.

Finally, we looked at towns as places to live. It appears that, many households live for a very long time (their whole life or more than 30 years) in the local area (zone A and B). Furthermore, we found that, of the T-HH, just between 2 and 15% only live in town, but do not shop or work there. In contrast, of the H-HH, between 26 and 69% do not shop or have no job in the hinterland. Instead, most of these H-HH use the town has a central place for shopping or working.

In the second part of this chapter, we focused more on the town as a place to buy goods and services. First of all, we performed a regression analysis to explain the distribution of household purchases over town and hinterland by household and the spatial characteristics of the local area. The analysis showed clearly that both the characteristics of the household and the spatial characteristics of the area affect the share of purchases bought in town or hinterland. Of the household characteristics, particularly the level of income, car-ownership, and the place of work affect the shopping behaviour of households. Important spatial characteristics are distance to the nearest city of 50,000 inhabitants, and the availability of shops.

These insights, together with the results found in the literature, were used to develop a multinomial logit model, which estimates the utility (benefit) for Dutch households to shop in zone A (town), B (hinterland), C (16 km zone) or D (the ROW). Therefore, four utility functions were developed which were run three times: for grocery, fun, and goal shopping.

From this analysis it appeared that particularly the location factors are very important to the spatial shopping behaviour of the Dutch households. As expected, the utility functions have different parameter values for the three different kinds of shopping; grocery, fun, and goal shopping. General location factors, such as distance and floor space, are important for all kinds of shopping, but mostly for grocery shopping. The town-specific dummies, related to shopping in the ROW (zone D), are only relevant for fun shopping. This is no surprise given the importance of this zone for fun shopping.

From the socio-economic factors, the place of work is the only variable which is significant for all three kinds of shopping. The length of residence is particularly relevant for grocery shopping, level of income for fun shopping, and car ownership for goal shopping.

Concerning the multifunctionality of towns, this chapter showed that particularly in England and France, the town is still the most important place for working and shopping, both for T-HH and for H-HH. In the Netherlands, Poland and Portugal, the hinterland is a more important place for facilities and employment for H-HH. When focusing more on the function of towns as a place to shop, it appears that spatial characteristics such as the availability and distance to shops, as well as the availability of local jobs, strongly affect the shopping behaviour of European households. In general, in countries like the Netherlands, Poland and Portugal, the network of towns is relatively fine-meshed, and facilities are more evenly distributed over the (rural) area. This results in a less strong regional function of towns for hinterland households.

Chapter 4
Farms in a Modern World: Local Integration and Off-Farm Employment

Abstract In particular in remote rural areas, farm households (still) form a significant part of the local population and thus contribute to the vitality of rural settlements. In addition, also in the more urbanized regions, they are important providers of amenities such as the rural landscape, traditions and tranquillity: often called the 'rural idyll', In this chapter, first, we explore the economic significance of farms to rural areas by focusing on the local (economic) integration of farms, compared to the local integration of firms of the same size. Furthermore, we will look at farms and different sources of income, to understand how important agricultural production is for the income of farmers in European rural areas today. Because farmers will remain of great importance for maintaining the landscape and (other) cultural heritage aspects, we see off-farm employment as an important contribution to preserving these amenities. Therefore, we also take a closer look at the factors that affect the choice for off-farm employment.

4.1 Introduction

In particular in remote rural areas, farm households (still) form a significant part of the local population and thus contribute to the vitality of rural settlements. In addition, also in the more urbanized regions, they are important providers of amenities such as the rural landscape, traditions and tranquillity: often called the 'rural idyll', appreciated by many urban and rural residents. In addition, farmers will become increasingly important as managers of the rural landscape, as well as of climate change measures such as water retention areas.

In most developed regions the histories of farming and (rural) towns have been closely intertwined, with farmers reliant traditionally on communities for material inputs and service provision and rural settlements oriented socially and economically toward agriculture. Thus, farm and community have formed a cohesive functioning unit in which interests and aspirations were widely understood and largely shared (Smithers et al. 2005).

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On the economic side, farmers frequently express a strong desire to purchase their goods and services locally, partly because of convenience but also because they wish to support local businesses (Joseph et al. 2001; Smithers et al. 2004). On the social side, farm families have a long history of engagement in local social and political life, often in a leadership role. This is often referred to as the strong local integration, or embeddedness of farms. Embeddedness emphasizes the importance of social relations in generating trust and discouraging opportunism, and also the linkages that an enterprise forms with a network of enterprises within the region. These include links, for the purpose of improving the activities of the firm, with local suppliers and customers (Granovetter 1985; Hinrichs 2000). The existence of trust relationships between local economic agents has been shown to be fundamental in many successful regions and is thought to be important in facilitating innovation (Fratesi and Senn 2009)

However, the fundamental shift away from the traditional modes of agricultural production in recent decades, which was described in Chap. 2, has changed production processes, as well as local networks. The general tendencies of these developments include: the intensification of production; concentration of production in fewer but larger units; and a trend towards product specialization (Ilbery and Bowler 1998; Wilson 2001). According to Pierce (1994), this has led to a 'disappearing middle' and forced a dualism in farm structure. In many regions a discernable gap has emerged between traditional modes of agricultural production associated with the family farm and those associated with corporate farming (Lobao 1990). It has been noted that large-scale modern farms, which can exist in both the family farm and corporate sectors, are increasingly linked vertically to agri-business and decreased local (economic) integration (Marsden 1998; Wallace 1992). In addition, globalization has been an interrelated contributor to the changing nature of agriculture (Robinson 1990); it has allowed agricultural production to be increasingly controlled from external sources (e.g. vertical integration) (Whatmore et al. 1987). Furthermore, institutional arrangements and regulatory structures that affect farming are also changing. Unable to justify agricultural price support to largely urban (voting) populations, many governments have reduced and/or abolished subsidies in recent years and exposed farmers to the effects of international competition (Wilson 1994).

It is understood that there are a number of alternative development pathways in modern agriculture. According to Bowler (1992), there are three pathways along which a farmer can develop: first of all, by maintaining the full-time, profitable and mainly food-producing role of a viable agricultural enterprise; secondly by income diversification achieved by restructuring the fixed assets of the farm household into non-agricultural activities, including off-farm employment; and thirdly, by marginalization of the farm as a profitable enterprise. According to Alasia et al. (2008), off-farm employment can arise from different motivations. It can, for example, be a self-insurance mechanism for households associated with an agricultural holding to help to stabilize total household income, given the inherent variability in net farm income. Next, off-farm employment may be necessary to provide sufficient income to cover family living expenses if the operator of the farm

is unable to generate enough revenue to support a family. Furthermore, off-farm labour may be the primary household employment for some residents, who have chosen a rural lifestyle.

The continuity that exists in rural economic and social life is evident in the area of off-farm employment, which can be seen as an increasingly frequent contact point between farmers and townspeople (Smithers et al. 2005). As noted earlier, some farmers have become highly dependent on additional sources of income to support the farm business, or to enhance the financial position of the household (Fuller 1990; Jervell 1999; Moran et al. 1993). However, it is also evident that off-farm employment constitutes an important means of retaining young farm people in rural areas and of maintaining, sometimes on a part-time basis, the active management of rural landscapes. As a new point of linkage, off-farm employment makes explicit the shift in the balance of interdependence between farming and the wider rural community (Joseph et al. 2001).

In this chapter, first, we explore the economic significance of farms to rural areas by focusing on the local (economic) integration of farms, compared to the local integration of firms of the same size. We take the size of the farms and firms into account because generally the (rural) economy is largely dependent on small enterprises. In the Netherlands as a whole, almost 90% of employees work in firms with less than ten people, in the UK this is as much as 70%. As larger offices often are situated in cities or highly urbanized areas, this percentage will be even higher in rural areas. With the relentless decline in employment in agricultural and other traditional rural industries, the identification and encouragement of new sources of jobs for those living in rural communities has become a key priority. Increasingly, it is believed that most of the new jobs in rural areas will have to come from new and existing small firms, not just from service sectors like tourism but also from some lighter manufacturing industries (Tarling et al. 1993).

In Sect. 4.3, the focus will be on farms and different sources of income, to understand how important agricultural production is for the income of farmers in European rural areas today. Because farmers will remain of great importance for maintaining the landscape and (other) cultural heritage aspects, we see off-farm employment as an important contribution to preserving these amenities. Therefore, in Sect. 4.4, we take a closer look at the factors that affect the choice for off-farm employment. In our analysis, we distinguish farm, household, and spatial characteristics, and we focus on farms those located in the Netherlands.

4.2 Economic Integration of Firms and Farms

4.2.1 Integration Indicator

Small and medium-sized towns are valuable for future rural development initiatives, because the concentration of initiatives within these settlements takes advantage of the existing economies of agglomeration and the existing networks.

At the same time, the benefits have the possibility (in terms of both employment and income) to spread out from these sub-poles into the surrounding countryside in a way that meets the economic objectives of sustainable rural development.

To describe the linkages of small enterprises in small and medium-sized towns with the surrounding countryside and existing networks, we make use of integration indicators. These indicators show the proportion of a particular economic activity (input purchases, output sales, employment, etc.) of a particular group of economic entities (all firms, all households, small enterprises, manufacturing enterprises, etc.) allocated to the (local) economy. For example, if a group of firms is located in area X, they may derive 25% of their inputs (by value) from other businesses locally (within zones A and B); a further 50% from elsewhere in the country, 5% from elsewhere in the EU; and 20% from countries outside the EU. In this case, the local integration indicator for the purchases of this group of firms is 0.25. They may sell only 10% of their outputs to businesses or households in the locality, in which case the local integration indicator for the sales of the town is 0.1. Taken together, and measured for a particular town, these indicators give an immediate measure of the extent to which a firm is integrated into its immediate locality or the national, European or global economy.

In this chapter, we are mainly interested in the local integration; however, we define four areas: local (zone A and B), regional (zone C), national and international. We distinguish between firms and farms, to see if there is any significant difference. Furthermore, we grouped the businesses according to their size (expressed in full-time job equivalents (FTEs)). The farms are grouped into those with 1–3 FTEs, and those with 3–10 FTEs. The firms, which are in general larger, have a third group: those with more than ten FTEs. See Table 4.1 for the total number of farms and firms available in each group.

When we look at the integration indicators, it is important to know which values of the different indicators are desirable for the economy of a small or medium-sized town. When a firm or farm buys its inputs on the local market, other (local) actors will have more money to spend. This can lead to new investments or to higher incomes, from which local shops and other services in a town can benefit. In turn, this leads to new investments, higher incomes or new jobs. This effect of the recirculation of spending is called the 'multiplier effect', a core theme in input-output approaches (see Chap. 5). The size of multipliers varies across different sectors of the economy based on the mix of labour and other inputs, and the tendency of each sector to buy goods and services from within the region. When

Table 4.1 Sample size of the firms and farms

	Size	England	France	Netherlands	Poland	Portugal
Farms	small (0–3 FTE)	67	154	290	450	159
	medium (3–10 FTE)	22	21	55	116	59
Firms	small (0–3 FTE)	270	331	448	670	537
	medium (3–10 FTE)	161	124	215	159	204
	large (>10 FTE)	64	52	93	70	117

sectors import substantial quantities of inputs from outside the local economy, their spending 'leaks' to the other region and the multiplier effect decreases. But when sectors sell their products outside the local economy, i.e. when they export them, more capital enters and the multiplier effect increases.

In addition it is important to note that a good balance of internal and inter-regional connections is very important. If the local or internal networks are too strong there is a risk of localism which can decrease the ability of the area as a whole to acquire external knowledge, hence decreasing innovation and competitiveness (Fratesi and Senn 2009).

This means that the desirable effects originate from enterprises that have high local integration indicators for their purchases and high national or international integration indicators for their sales.[1]

4.2.2 Integration of Expenditures and Sales of Farms and Firms

When looking at the local integration indicators of the expenditures of firms and farms in the five European countries concerned, it appears, first of all, that there are some clear national differences (see Fig. 4.1). In general, businesses are less locally integrated in England compared with Poland and Portugal. However, in the five countries the difference between farms and firms of different sizes are very similar. In each country, the share of local expenditures of farms is larger than that of firms; furthermore, the share of local expenditures of smaller businesses is in general

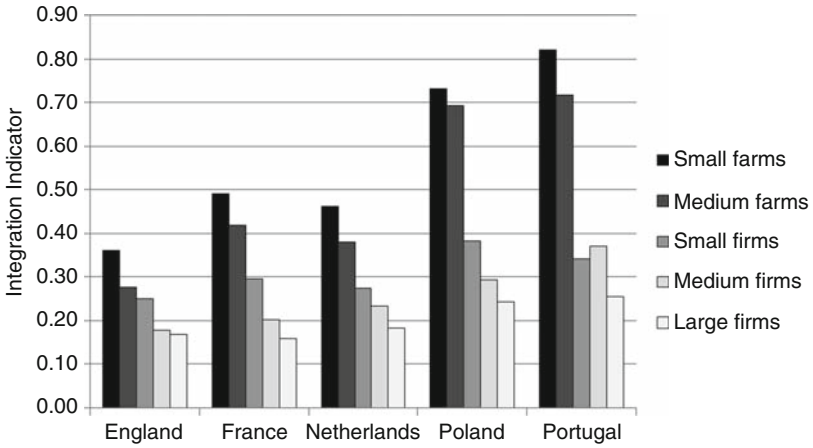

Fig. 4.1 Local integration of expenditures of farms and firms

[1]We have to keep in mind that the indicator only describes the allocation of sales and purchases of the enterprises that responded to the questionnaire, and not all the enterprises within a certain town.

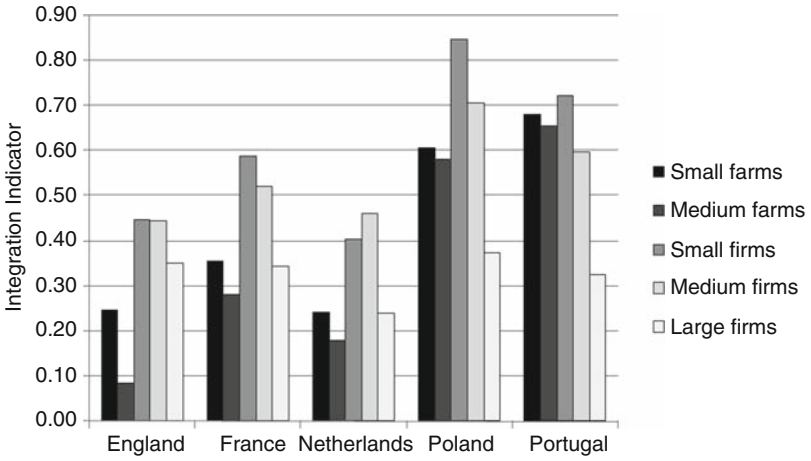

Fig. 4.2 Local integration of sales of farms and firms

higher than that of larger businesses. The larger firms and farms obtain more of their inputs at the national level (for the indicators at all four levels see, Appendix 4.1). This confirms the idea that farms are more locally integrated concerning their expenditures than firms; in particular in Poland and Portugal there is a clear difference.

When looking at the local integration of the sales a different picture evolves (see Fig. 4.2). Again, the national differences are clear, with Poland and Portugal having strong local networks and the other three countries weaker ones. Similar to the situation with the expenditures, the smaller farms and firms are more locally embedded: they sell more to the local market. However, an important difference when farms and firms are compared: the firms sell far higher shares of their total output to the local market. An explanation for this could be that agricultural products often need to be processed first before they are sold to consumers. This often takes place outside the local economy.

As mentioned earlier, according to the theory that deals with multiplier effects, it is more favourable for the local economy if businesses buy most of their inputs at the local market and sell their outputs outside the local economy. This way, capital enters the economy. From this perspective, the integration indicator suggests that farms are particularly important to the town economy, because the share of their local inputs is larger than that of their local outputs.

4.2.3 Local Expenditures and Sales in Absolute Values

The integration indicators showed the share of expenditures and sales of businesses in the local economy. These relative values indicate that farms and firms in Poland and Portugal are in general more locally integrated than businesses in the other

countries, and that smaller businesses are also more locally integrated. Of course, these relative values at the (agricultural) firm level are less important for the local economy than absolute values. So what are the actual local expenditures and sales? Figures 4.3 and 4.4 show the absolute sales and purchases in 2003-euros, calculated as the average amounts of euros of the businesses under research. Only the results of the small and medium-sized firms are shown, because the (average) local expenditures and sales of the large firms are too large to show on the figures (for the exact values, see Appendix 4.2).

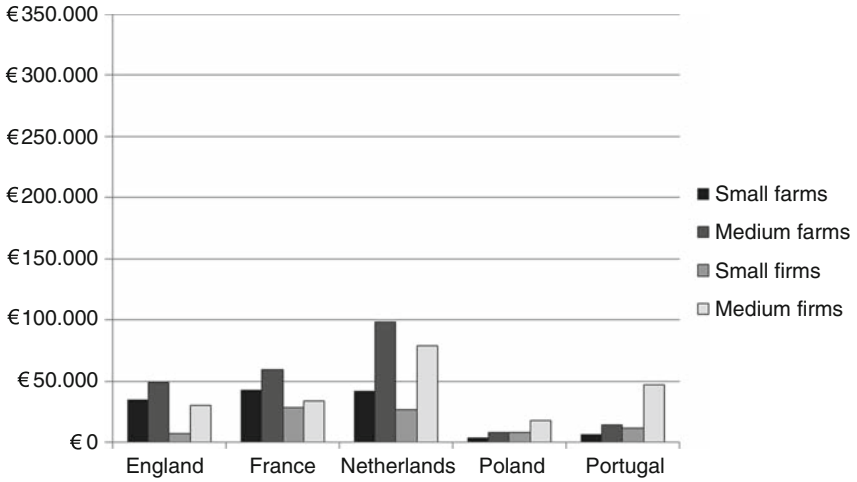

Fig. 4.3 Average monthly expenditures of farms and firms in the local economy

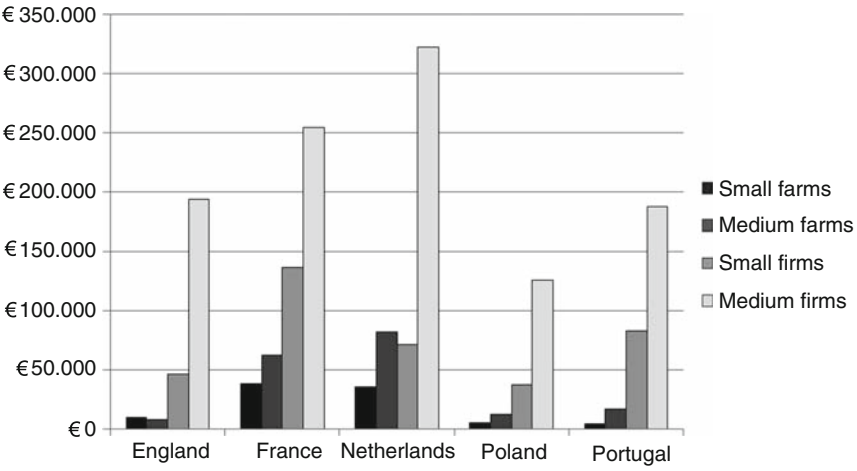

Fig. 4.4 Average monthly sales of farms and firms to the local economy

When looking at the expenditures of farms and firms we find that, in absolute terms, local expenditures of medium-sized and large farms and firms are larger than those of small farms and firms. However, in England, France and the Netherlands, farms tend to spend more in town and hinterland than firms of similar size. Furthermore, in particular in England and the Netherlands, local sales of farms are smaller than local expenditures.

When looking at the average sales, again the local sales of firms is significantly higher than the local sales of farms. The average local sales of large firms (not in the figure) are as much as €1 million a month in the English towns.

From this we can conclude that, when looking at their expenditures and sales, farms are indeed important for the local economy. Although the local integration indicators of particularly larger firms are smaller than those of small and medium firms, larger firms with more than ten employees (FTE) also buy large quantities of inputs (in absolute terms) on the local market. In addition, because of their stronger national and international integration, they are more likely to bring new knowledge and innovations into the local economy.

4.3 Income Sources of Farm Households

As mentioned in the Introduction to this chapter, increasingly farm households are obtaining their income not only through agricultural production but also through other activities. All over the world, farmers can be found who struggle to achieve an adequate income. Although many of them would agree with the statement that farming is more than just an occupation, the uncertainty of the level of production and income each year can make it a hard way of living.

In some developing countries, the low cost of living, possibilities for subsistence production, available housing, and social network ties have attracted dislocated urban workers and retained longer-term rural residents. A feature of (full) employment in agriculture in those areas is therefore underemployment and hidden unemployment (Rizov 2005). In other regions, full employment of a farmer in agricultural activities would indicate that the farm is doing well and enough income is being raised. According to Findeis et al. (1991), in some regions declines in (rural) wages in manufacturing and in the service sector may increase the likelihood of labour moving into agriculture to supplement falling wages in other sectors.

All in all, it seems income diversification is the norm among rural households, and different income generating activities offer alternative pathways out of poverty for households, as well as a mechanism for managing risk in an uncertain environment (Davis et al. 2010).

Since the 1980s, direct national and supra-national government support for agricultural diversification has become an explicit policy in the EU. For example, financial support for agricultural diversification and agri-tourism has been included in support measures for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF), with the aim of improving economic opportunities and accessibility in disadvantaged rural regions (Chaplin 2004).

According to the study of Davis et al. (2010), who looked at thousands of households in 18 underdeveloped countries, off-farm sources of income account for 50% of total income in almost two-thirds of the countries of the data-set. They conclude that a higher level of off-farm employment indicates higher economic development.

Table 4.2 shows the average shares of different income sources of farm households in England, France, the Netherlands, Poland, and Portugal resulting from the Marketowns questionnaires. Surprisingly, it appears that the Dutch farm households that were questioned obtain the largest share of their income from production, as much as 80% on average.[2] In France too, the share of income from production is relatively high. However, in Portugal only 40% of the household income is obtained from the farm.

These differences in part reflect variations in farm size, human capital, and the availability of non-agricultural opportunities. Apparently, in the Netherlands and France, the farm size and human capital allow on-farm developments.

When looking at Fig. 4.5, which shows the distribution of different sized farms questioned in the five countries it appears that in Poland and Portugal more than 60% of the farms have an area of less than 5 ha.

Table 4.2 Average shares of different income sources of farm households in the five EU countries

	England	France	Netherlands	Poland	Portugal
Income from production	64	76	80	61	39
Other on-farm income	7	2	2	1	1
Off-farm income	29	22	17	38	60
n	103	170	410	599	257

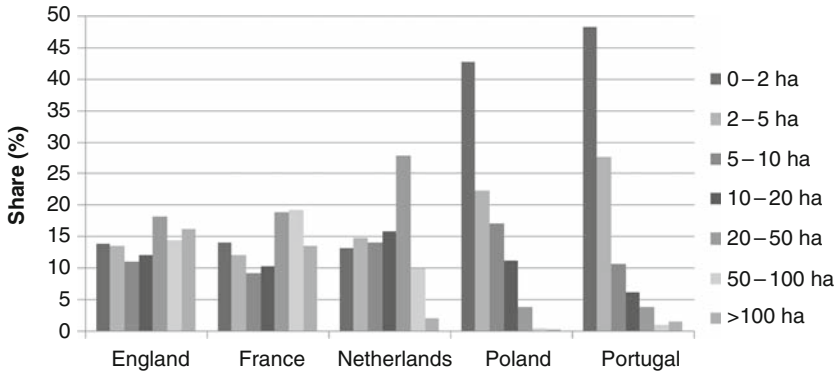

Fig. 4.5 Distribution of farms by land area of the farms in the database

[2]This is in line with results from the 'Farm Accountancy Data Network' of LEI, the Hague.

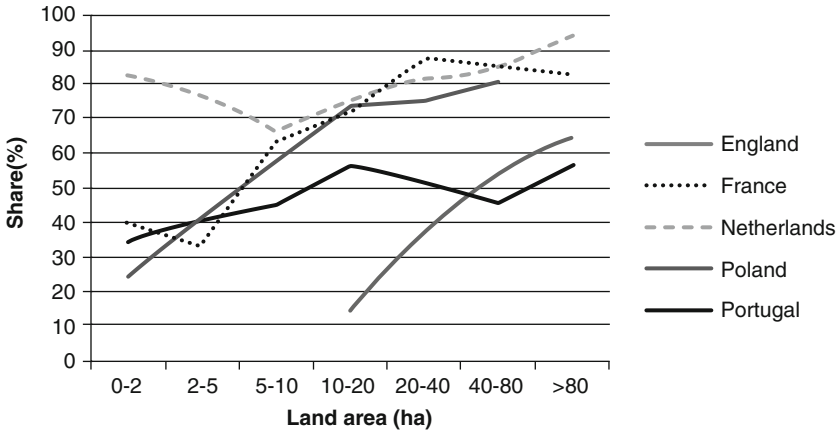

Fig. 4.6 Share of income obtained from agricultural production in relation to the size of the farm

In Portugal, and to a lesser extent in Poland, income from outside the farm is very important. It appears that half of these farm households have a job outside the farm, and the other half receives income from pensions or other allowances. Interestingly, in the Netherlands and France only around 20% of the off-farm income comes from pensions.

When looking at the share of income from agricultural production of differently-sized farms (see Fig. 4.6), it appears that, in general, smaller farms obtain a smaller share of income from the farm. Particularly in France and Poland, there seems to be a clear relationship. In the Netherlands, the share of income from agricultural production is, in general, high and differs much less between differently-sized farms. Apparently, in the Netherlands other factors affect the choice for off-farm employment.

4.4 Off-Farm Employment in the Netherlands

The previous section showed that in the Netherlands, in general, income obtained from agricultural production is relatively high and does not differ very much between differently- sized farms. In this section we try to analyse what the factors are that affect the choice to work off the farm.

4.4.1 Relevant Variables

According to several studies there are numerous factors that affect the farmer's household's choice to engage in off-farm employment. These factors can be divided into household, farm, and spatial characteristics.

4.4.1.1 Household Variables

Several studies indicate that the level of education affects the choice for off-farm employment. Higher education extends the number of jobs for which a person is qualified, and these jobs usually have higher salaries. Increases in marginal returns from education are higher for off-farm employment than for farm work. This would imply a positive effect for education on off-farm employment, which is indeed found by Chaplin et al. (2004) and Alasia et al. (2008). On the other hand, a higher education also allows a farmer to better manage the enterprise, and to apply for subsidies and grants. Therefore Mishra and Goodwin (1997) found a negative effect of education on off-farm employment, while Woldehanna et al. (2000) found neither a positive nor a negative effect.

Possibly the size or potential of the farm is also important. This is also what Alasia et al. (2008) find: Compared to the average operator, the average farmer with a university degree is almost 20% more likely to work off-farm; however for operators of larger farms, this probability differential reduces to about 9%.

Related to this, family income can be an important reason for engaging in off-farm employment. Among others, Sofer (2005) finds that, in a comparison of Israeli households with low or medium income, the latter are more likely to conduct business off the farm.

Concerning age it appears that old farmers often combine their agricultural activities with retirement pensions, and hence, they are not likely to start off-farm employment as it is more difficult to get a job at an older age (see also Goodwin and Mishra 2004). According to Alasia et al. (2008), younger farmers are more likely to take off-farm employment, but when they reach the age of 35 this probability decreases.

The number of household members is supposed to have a positive impact on the share of off-farm income because they can divide the on-farm work, and some members will choose to fully work off-farm. At the same time, the presence of children under the age of 13 in the household significantly reduces the supply of off-farm labour. Such an effect is typically confirmed for spouses, though the expectations for farm operators (typically male heads of households) are less clear (Goodwin and Mishra 2004). According to Lass et al. (1991), the number of children is positively associated with off-farm employment for farm men, but the association is negative for farm women. More children may imply more need for additional income but also additional child care at home. Finally, attachment to the farm, in terms of, for example, how long the farm has been owned by the family, is expected to negatively affect off-farm income (Sofer 2005). But farm households' ties to the local community, i.e. how long they have been living in the area, often results in pluriactivity as a farm business survival strategy, with households searching first in their local community for an off-farm job (Smithers et al. 2004).

4.4.1.2 Farm Variables

The size of the farm (expressed in hectares, or in number of workers, or the turnover in case of intensive farming) is supposed to have a major impact on off-farm

employment. Industrial development often demands large investments (technology, land), and is therefore only a realistic option for medium- and large-sized farms (Meert et al. 2005). Moreover, Fernandez-Cornejo (2007) found that operators of smaller farms typically participated more in off-farm employment, worked more hours off the farm, and had a higher off-farm income than those of larger farms. Therefore, it is expected that farmers with a medium or large farm will less often be involved in off-farm employment.

With regard to ownership, Boisvert and Chang (2006) find that the negative effect of tenancy (as measured by the proportion of acreage owned) on the likelihood for off-farm job participation reflects a greater commitment to agricultural production from operators who own their own land. Finally, Boisvert and Chang (2006) expect that the level of off-farm employment will differ between farm types, such as arable dairy, or horticulture farms.

4.4.1.3 Spatial Variables

The supply of off-farm labour has been shown to be positively related to urban proximity (Lass et al. 1991). Moreover, Gardner (2001) found that in the United States, farmers' income growth is inversely related to the rural share of a State's population. Apparently, a larger non-agricultural population has a positive effect on farmers' incomes, because it increases their off-farm earnings opportunities and increases the demand for the goods and services that farmers produce.

Chaplin et al. (2004) find that the availability of public transport in countries such as Poland and Hungary has a positive effect on off-farm employment. However, Goodwin and Mishra (2004) find in their study about US farm families that the number of miles to the nearest town, a factor representing the cost of commuting, does not appear to significantly influence the supply of labour off the farm.

In addition, according to Boisvert and Chang (2006), there is some indication that the strength of the local economy, as measured by the proportion of jobs that are in manufacturing, increases the likelihood of participation in off-farm work. However, the extent to which the local economy depends on jobs in the trade sector reduces the likelihood of participation in off-farm work.

4.4.2 Data Collection and Preparation

From both farm households and farms, in total 455 Dutch respondents returned the surveys, with the response rates for the different surveys and study areas ranging from 13 to 20%. In 290 of these cases (64%) we could link an agricultural household to its individual farm business. Further, in these cases the response to questions about on- and off-farm income of the household and the business questionnaire were filled out completely and matched in both surveys. These 290 cases give us a vast amount of information on both the farm business and the

Table 4.3 Selection of characteristics for estimation of off-farm employment of Dutch farmers: variables (left) and operationalization (right)

Variables	Operationalization
Structural characteristics (household and farm)	
Size (surface)	Measured in hectares
Size (turnover)	Measured in euros (× 1,000 euros)
Farm type	Nine types of farms
Non-labour income	Income from pensions, interest etc.
Age	Age of the farmer classified into five age groups
Local attachment	Number of years the household has lived at the current location
Number of members	Number of household members
Spatial characteristics	
Distance to nearest city >50,000 inhabitants	Euclidean distance (in kilometres) to nearest urban area with more than 50,000 inhabitants
Level of rurality	Address density data from Statistics Netherlands (www.cbs.nl), measured as a weighted average of the address densities per neighbourhood
Available jobs in other sectors per (COROP) region	Regional employment data (number of jobs per 1,000 inhabitants) for different sectors from Real Estate Monitor 2007 (ABF Research)

related household simultaneously. For the spatial characteristics related to the survey respondents, we collected various spatial data sets, and made intensive use of a Geographical Information System to derive spatially-explicit variables.

Table 4.3 shows the selection of factors that affect the choice for off-farm employment. Apart from the variables found in the literature, we added the share of non-labour income to correct for non-farm income such as pensions. Twenty farms also had other on-farm activities (such as a camp site or selling products), but no relationship was found with the level of off-farm income. Unfortunately, we lack information about the education level of the farmers.

4.4.3 Off-Farm Activities

From the total 290 farm households, 44 receive income from pensions or allowances, and 113 from an off-farm job. Not unexpectedly, it appears that the older the farmer is, the higher the share of income from pensions or allowances. However, in this paper, we are specifically interested in off-farm employment, so the focus is on income from 'payroll employment'. From all farm households included in this analysis, 61% do not have an off-farm job, 15% receive 1–20% of their income from a job outside the farm, 8% earn 21–40% of their income at an off-farm job; another 8% earn 41–60% off-farm; and yet another 8% earn more than 61% off-farm (Table 4.4). The off-farm sector in which the households are most often involved is the public administration, education and health sector. This sector is, in general, a very important employment sector in rural areas (see Chap. 3).

Table 4.4 Percentage distribution of off-farm labour income classes per case-study area

Town	n	0%	0–20%	21–40%	41–60%	61–80%	81–100%
Dalfsen	60	50.0	16.7	6.7	11.7	6.7	8.3
Schagen	51	68.6	17.6	3.9	7.8	2.0	0.0
Bolsward	52	59.6	19.2	11.5	5.8	1.9	1.9
Nunspeet	17	41.2	5.9	5.9	17.6	17.6	11.8
Oudewater	52	55.8	17.3	5.8	7.7	9.6	3.8
Gemert	58	77.6	8.6	12.1	1.7	0.0	0.0
Total	290	61.0	15.2	7.9	7.6	4.8	3.4

Table 4.5 Percentage distribution of off-farm labour income classes in farm types

Farm type	n	0%	0–20%	21–40%	41–60%	61–80%	81–100%
Dairy farming	100	56.0	12.0	10.0	8.0	8.0	6.0
Horticulture	31	61.3	16.1	9.7	12.9	0.0	0.0
Intensive livestock	29	75.9	10.3	3.4	3.4	6.9	0.0
Mixed farming	112	62.5	17.9	8.0	7.2	1.8	2.7
Other	18	55.5	22.2	0.0	5.5	11.1	5.6
Total	290	61.0	15.2	7.9	7.6	4.8	3.4

Table 4.6 Percentage distribution of off-farm labour income classes in age groups

Age group	n	0%	0–20%	21–40%	41–60%	61–80%	81–100%
<25	1	100.0	0.0	0.0	0.0	0.0	0.0
25–34	34	52.9	17.6	8.8	11.8	5.9	2.9
35–44	96	51.0	18.8	12.5	6.3	6.3	5.2
45–54	86	61.6	14.0	7.0	11.6	4.7	1.2
55–64	56	75.0	12.5	3.6	3.6	1.8	3.6
≥65	15	86.7	6.7	0.0	0.0	0.0	6.7
Total	288	61.1	15.3	8.0	7.6	4.5	3.5

Table 4.4 further shows that, in Gemert and Schagen, the level of off-farm employment is relatively low, while it is relatively high in Nunspeet and Dalfsen (which are located in the same region). This supports the idea of the importance of spatial variables.

Table 4.5 shows the importance of off-farm employment for different types of farms. First of all, it appears that, in intensive livestock farming, 75% of the farmers receive their income totally from farm activities. This is the highest share. In dairy farming, this share is only 56%, and as much as 14% earn more than 61% of their income off-farm. Finally, Table 4.6, shows that, the younger the farmers, the higher the share of off-farm employment. In the farm households where the farmers are between 25 and 44 years old, almost half have a member with an off-farm job. For the age group 55–64, this is only a quarter.

4.5 Estimating the Behaviour of Farmers

To estimate the share of off-farm income in total farm household income we use a tobit model. A tobit model is a regression model in which the dependent variable is observed in only some of the ranges. The model can also be referred to as the censored regression model. It is a standard regression model, where, in general, all negative values are mapped to zero (this means that observations are censored (from below) at zero). The model thus describes two things: the probability that y_i is zero, and the distribution of y_i given that it is positive (Maddala 1983).

Because we use percentages of total household income, we have an upper and lower limit in the data (respectively, 0 and 100%). Therefore, a two-limited tobit model will be used:

$$y_i^* = x_i\beta + \in_i,$$

$$y_i = y_i^* \quad \text{if} \quad 0 < y_i^* < 100,$$

$$y_i = 0 \quad \text{if} \quad y_i^* \leq 0,$$

$$y_i = 100 \quad \text{if} \quad y_i^* \geq 100.$$

There are three groups of explanatory variables: farm characteristics, household characteristics, and spatial characteristics. The results of the partial models and the total model are presented in Table 4.7.

First of all, when looking at the log likelihood of the partial models, it appears that the selected farm characteristics have a relatively weak explanatory power, while the spatial variables explain most of the diversity in the share of off-farm income. Not surprisingly, the combination of all characteristics explains different off-farm income levels the best.

From the farm characteristics, in particular the surface of the farm is important, even when controlling for turnover; the larger the farm, the lower the share of off-farm employment. The turnover itself does not seem to significantly affect off-farm income. Furthermore, there are differences between different kinds of farms, in particular family members from dairy farms tend to have an additional job outside the farm.

Most of the household characteristics that we included significantly affect the share of off-farm income. Only the share of non-labour income, obtained from the government (such as pensions) or from financial institutions (such as interest) is not significant. The age of the farmer plays a significant role: the older the farmer, the higher the share of income obtained from the farm, even when taking into account non-labour income such as pensions. Furthermore, households who have always lived in the specific area more often tend to obtain income from outside the farm. Furthermore, in larger families too, a higher share of the total household income is earned outside the farm by one of the members.

Table 4.7 Results of the two-limited tobit models estimating the share of off-farm income in percentages

Variable	Farm	Household	Spatial	All
Surface (ha)	−0.419			−0.381
	(−2.606)			(−1.823)
Turnover (×1000)	−0.013			−0.013
	(−0.988)			(−1.031)
Dairy farm (d)	16.955			13.115
	(2.334)			(1.634)
Intensive livestock (d)	−9.191			−5.317
	(−0.694)			(−0.366)
Horticulture (d)	−6.899			−5.838
	(−0.524)			(−0.401)
Other (d)	17.583			29.139
	(1.081)			(1.836)
Non-labour income (%)*		−0.430		−0.366
		(−1.498)		(−1.370)
Age farmer (6 classes)		−8.943		−7.537
		(−3.736)		(−2.138)
Always lived here (d)		11.903		13.408
		(1.590)		(1.785)
Family members (#)		3.902		4.379
		(2.057)		(1.820)
Distance city >50,000 inh. (km)			−0.452	−0.093
			(−0.862)	(−0.169)
Avg. address density within 1 km			0.048	0.038
			(2.067)	(1.681)
Jobs per Corop-region per sector (/1,000 in.)				
In agriculture			−2.315	−1.628
			(−4.176)	(−2.589)
In industry			−0.058	−0.005
			(−0.576)	(−0.042)
In commercial services			−0.314	−0.284
			(−2.735)	(−2.522)
In non-commercial services			0.563	0.493
			(3.341)	(3.005)
Log likelihood	−668.281	−666.159	−663.685	−650.791

Notes: Percentage of the rest of the income (total income minus off-farm labour income)
t-values are shown in parentheses

As mentioned earlier, the spatial characteristics seem to be relatively important, in particular the availability of jobs per 1,000 inhabitants in the region. When the region is more oriented towards agricultural activities (a larger number of agricultural jobs), it is less likely that someone from the household will take an off-farm job. This could indicate that in regions with a relatively large number of jobs in agriculture there are less possibilities for off-farm employment, or that off-farm employment is not necessary due to economies of scale or efficiency reasons. Furthermore, the number of jobs in the industrial sector and in the commercial services sector also has a negative impact on off-farm employment. However, when there are a large number of jobs available in the non-commercial services sector,

it is more likely that the farmer households will obtain off-farm income. This illustrates the importance of this sector and thus of governmental activities in rural areas. In addition, the address density also positively affects the share of off-farm income: more urbanized rural areas offer more off-farm employment or less on-farm employment opportunities.

In the total model including all variables with the highest explanatory power, we do not observe many differences compared with the partial models. The size of the farm remains important, as does the kind of farm. Only in the total model are 'other' kinds of farms also significantly related to higher shares of off-farm income (compared with mixed farms). The family characteristics have the same impact. Of the spatial variables, the significant ones are again the same: address density, and the number of jobs in the agricultural, commercial and non-commercial sectors.

4.6 Conclusions

In this chapter the (economic) importance of farms in the rural economy has been addressed through the analysis of (local) integration indicators of both farms and firms, as well as of different sources of farm household income.

When looking at the local integration indicators of the expenditures of firms and farms in the five European countries, it appears, first of all, that there are some clear national differences. In general, businesses are less integrated in England compared with Poland and Portugal. However, in all five countries, the difference between farms and firms of different sizes are very similar. In each country the share of local expenditures of farms is larger than that of firms; furthermore, the share of the expenditures of smaller businesses is in general higher than that of larger businesses.

As mentioned earlier, according to the theory dealing with multiplier effects, it is more favourable for the local economy if businesses buy most of their inputs at the local market and sell their outputs outside the local economy. This way, capital enters the economy. From this perspective, this analysis suggests that farms in particular are important to the local economy, because the share of local inputs is larger than local outputs. In addition, in absolute terms, the local expenditures and sales are also relatively high. Although the local integration indicators of larger firms are smaller than those of small and medium-sized firms, large firms with more than ten employees (FTEs) also obtain large quantities of inputs (in absolute terms) on the local market. In addition, because of their stronger national and international integration, they are more likely to bring new knowledge and innovations into the local economy, which makes them important to the local economy as well.

However, it appears that not all farm households are able or willing to obtain their income only from agricultural activities. When focussing on the different income sources of European farmers, it appears there are clear national differences: in countries such as Portugal and Poland additional off-farm income is relatively

important while in France and the Netherlands most income is obtained from agricultural production. In most countries, off-farm employment is negatively related with the size of the farm, but this does not seem to be the case in the Netherlands.

However, when we use a tobit model to estimate the share of off-farm employment of Dutch farmers, it appears that size, together with type of farm does significantly affect the share of off-farm employment. However, family characteristics, such as age of the farmer and number of family members are also important, together with spatial characteristics such as address density and the availability of jobs in different sectors in the region. This analysis shows that the choice for off-farm employment is related to many factors, which can be grouped into farm, household, and spatial factors, and that their distinctive impacts differ between different countries. These insights are in particular relevant for (new) rural policy frameworks that aim at retaining (farm) households in smaller towns because they can play an important role in the management of rural landscapes and in maintaining a certain level of local facilities.

Appendix 4.1: Integration Indicators for All Areas

See Tables 4.8–4.11

Table 4.8 Integration of the expenditures of small and medium-sized farms in different areas

Farm size		England	France	Netherlands	Poland	Portugal
Small	Local	36	49	46	73	82
	Regional	22	13	25	14	11
	National	41	34	27	12	7
	International	0	4	2	1	0
Medium	Local	28	42	38	69	72
	Regional	17	14	28	16	14
	National	50	40	32	13	13
	International	4	4	2	1	1

Table 4.9 Integration of the sales of small and medium-sized farms in different areas

Farm size		England	France	Netherlands	Poland	Portugal
Small	Local	25	35	24	60	68
	Regional	25	15	14	17	14
	National	49	47	58	22	17
	International	2	3	3	0	1
Medium	Local	8	28	18	58	65
	Regional	11	19	11	14	16
	National	80	51	69	27	18
	International	0	2	2	0	1

Table 4.10 Integration of the expenditures of small, medium-sized and large firms in different areas

Firm size		England	France	Netherlands	Poland	Portugal
Small	Local	25	30	27	38	34
	Regional	13	7	15	13	12
	National	53	60	51	47	49
	International	5	2	7	1	4
Medium	Local	18	20	23	29	37
	Regional	11	7	17	12	9
	National	64	66	51	51	46
	International	7	7	9	7	8
Large	Local	17	16	18	24	25
	Regional	7	6	9	9	14
	National	66	73	63	57	51
	International	10	6	10	10	9

Table 4.11 Integration of the sales of small, medium-sized and large firms in different areas

Firm size		England	France	Netherlands	Poland	Portugal
Small	Local	44	59	40	85	72
	Regional	13	20	16	7	11
	National	35	7	39	8	12
	International	5	66	5	0	5
Medium	Local	44	52	46	71	60
	Regional	10	10	15	9	14
	National	38	35	33	19	19
	International	6	3	5	1	7
Large	Local	35	34	24	37	33
	Regional	8	8	15	13	14
	National	50	50	53	44	35
	International	6	3	8	5	19

Appendix 4.2: Absolute Local Expenditures and Sales

See Tables 4.12–4.15

Table 4.12 Absolute average expenditures of small and medium-sized farms in the local area (in 2003 euros)

Farm size	England	France	Netherlands	Poland	Portugal
Small	34,643	42,110	41,745	3,971	5,838
Medium	48,995	58,972	98,135	8,311	14,456

Table 4.13 Absolute average sales of small and medium-sized farms in the local area (in 2003 euros)

Farm size	England	France	Netherlands	Poland	Portugal
Small	9,689	38,613	35,889	5,030	4,751
Medium	8,236	62,490	81,778	12,394	16,898

Table 4.14 Absolute average expenditures of small, medium-sized and large firms in the local area (in 2003 euros)

Firm size	England	France	Netherlands	Poland	Portugal
Small	7,216	28,020	26,940	8,176	11,212
Medium	30,242	33,439	79,278	17,321	46,546
Large	175,751	173,681	665,504	105,996	534,315

Table 4.15 Absolute average sales of small, medium-sized and large firms in the local area (in 2003 euros)

Firm size	England	France	Netherlands	Poland	Portugal
Small	46,725	136,449	71,117	37,745	83,015
Medium	194,027	254,102	321,932	125,617	187,762
Large	981,762	2,185,579	872,716	570,115	441,169

Chapter 5
Town-Hinterland Relations: A Social Accounting Matrix Approach

Abstract A Social Accounting Matrix (SAM) can be seen as an analytical and predictive tool to represent and forecast system-wide effects of changes in exogenous factors. A great advantage of a SAM is its ability to capture a wide variety of developments in a (macro-) economy, as it links production, factor and income accounts. We use SAMs in this chapter because it focuses on the current economic structure of towns and hinterland, and SAMs can handle a very disaggregated sector structure. In this chapter we use 30 European SAMs describing the local town and hinterland economy. First of all, we will discuss some earlier SAM-based studies, the SAM framework, and the advantages and disadvantages of a SAM approach. Secondly, the development of regional or local SAMs will be described. We then discuss the results. First of all, we show some analytical results, describing the economic structure of European small and medium-sized towns. This is followed by an output and income multiplier analysis and the identification of key-sectors in rural areas.

5.1 The SAM-Framework

5.1.1 Introduction

Social Accounting Matrices (SAMs) were initially developed because of a growing dissatisfaction with existing growth policies, especially concerning developing countries (see, e.g. Adelman and Robinson 1978; Pyatt and Round 1977). In these countries income redistribution is often an important subject. Therefore, researchers in the late 1970s were eager to learn more about the processes and mechanisms dealing with the production of goods and services and the associated income formation and income distribution. Traditionally, input–output models (developed by Leontief in 1951) were used to analyse production linkages in an economy. Input–output analysis is an established technique in quantitative

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economic research. It belongs to the family of impact assessment methods and aims to map out the direct and indirect consequences of an initial impulse into an economic system across all economic sectors. It is essentially a method that depicts the system-wide effects of an exogenous change in a relevant economic system (van Leeuwen et al. 2005).

Input–output models are based on the idea that any output requires a corresponding input. Such input may comprise raw materials and services, all coming from other sectors but also labour from households or certain amenities provided by the government. The output consists of a sectoral variety of products and services. However, a conventional input–output model does not take into account the link between increased output, the factorial and household income distribution and increased consumption. Therefore, a new kind of model had to be developed. SAMs combine data on production and income generation, as can be found in input–output tables, together with data about incomes received by different institutions and on the spending of these incomes. Therefore, a SAM allows us not only to analyse (regional) production linkages but also to focus on production-income and income-expenditure relations in a specific area.

Nowadays, a natural extension of a SAM, a static framework with fixed prices, is a computable general equilibrium (CGE) model, which can be considered dynamic with endogenized prices (Isard et al. 1998). CGE models use a SAM as the base-year but, in addition, include a number of behavioural and structural relationships to describe the behaviour of certain actors over time. The CGE approach permits prices of inputs to vary with respect to changes in output prices and, thus, allows the behaviour of economic agents to be captured (van den Bergh and Hofkes 1999). Notwithstanding the advantages of CGE models, we use SAMs in this chapter. An important reason for this is that it focuses on the current economic structure of towns and hinterland, and SAMs can handle a more disaggregated sector structure. Furthermore, we will add a behavioural component to the SAM in Chap. 7.

In this chapter we use 30 European SAMs describing the local town and hinterland economy. In the rest of Sect. 5.1, we will discuss some earlier SAM-based studies, the SAM framework, and the advantages and disadvantages of a SAM approach. Section 5.2 deals with the development of regional or local SAMs. We then discuss the results. First of all, in Sect. 5.3 we show some analytical results, describing the economic structure of European small and medium-sized towns. This is followed in Sect. 5.4 by an output and income multiplier analysis. Finally, Section 5.5 draws some conclusions.

5.1.2 Examples of SAM-Based Studies

The SAM methodology has been used extensively to analyse a variety of different questions at different levels of geographical aggregation (Isard et al. 1998).

In developing countries, it has been used widely to explore issues such as income distribution (Adelman and Robinson 1978), the role of the public sector

(Pleskovic and Trevino 1985), and the impact of inter-sectoral linkages on (rural) poverty alleviation (Thorbecke 1995; Khan 1999).

In developed countries, SAMs at the national level have been used to analyse the effect of different taxation or subsidy schemes on income distribution (e.g. Roland-Holst and Sancho 1992; Psaltopoulos et al. 2006). However, today, much emphasis is put on environmental flows, instead of monetary flows. These SAMs integrate, for example, physical water circular flow and emissions to the atmosphere of greenhouse gases (GE), together with the economic flows sourced from the National Accounting of, in this case, Spain (Morilla et al. 2007). Another example is the study of Sánchez-Chóliza et al. (2007). Their objective was to assess the environmental impact of the lifestyle enjoyed by the population of Spain; and to estimate the total and per capita pollution associated with household activity. The use of a SAM model facilitated understanding of how the pollution associated with household activity and consumption patterns "circulates" throughout the map of an economy. The SAM accounts were expressed in terms of different kinds of pollution, such as waste water, NO_x, or CO_2.

Furthermore, examples can be found of regional or town level SAMs. Most of them deal with towns in developing countries (e.g. Adelman et al. 1988; Parikh and Thorbecke 1996). Lewis (1991) describes a SAM application on town level of the Kenyan town Kutus. The SAM encompasses both the town of around 5,000 inhabitants and the 8 km zone around it (hinterland) with a population of 42,000. The SAM was used to test the governmental assumption of agriculturally-driven regional economies and to evaluate non-agricultural production sector activities in the Kutus region. According to the Lewis's multiplier analysis, agricultural activities were indeed very important for the stimulation of regional output and income.

The SAMs used in this chapter are also developed at the town level. However, they make a distinction between the town, the 7 km hinterland zone, and the rest of the world (ROW); they are interregional SAMs. They will be used to explore the relative economic importance of town and hinterland and to distinguish which sectors can be identified as local key-sectors.

5.1.3 Structure of a SAM Table

A SAM can be described as a general equilibrium data system of income and expenditure accounts, linking production activities, factors of production, and institutions in an economy (Courtney et al. 2007). Figure 5.1 shows the economic flows and interrelations captured by a SAM. The industrial production generates value added, which is used to pay for primary inputs. These primary inputs consist of profits, wages, and payments to the government. Next, these incomes, generated in production, are handed over to households or the government. After a redistribution process, incomes are either used for (final) consumption or they are saved. The final consumption leads to new production by industries, and the whole process starts

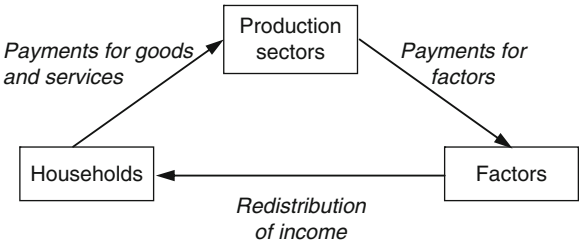

Fig. 5.1 The direction of income flows between the three main types of accounts in a SAM
Source: Based on Roberts (2005)

Table 5.1 The elements of a SAM table

To	From	Endogenous accounts			Exogenous accounts	Total
		Production	Factors	Households		
Endogenous accounts	Production	A_{11}		A_{13}	X_1	Y_1
	Factors	A_{21}			X_2	Y_2
	Households		A_{32}		X_3	Y_3
Exogenous accounts		Residual balance[a]				
Total		Y'_1	Y'_2	Y'3		

[a]Used to meet the assumption that $Y_1 = Y'_1$
Source: Based on Cohen (1989)

again. From Fig. 5.1 it becomes clear that input–output tables, which only focus on production linkages, ignore the effects arising from other linkages, as exist, for example, between households' income and the production sectors (final demand).

Similar to an input–output table, a SAM presents a series of accounts together in one matrix. It contains a complete list of accounts describing income, expenditure, transfers and production flows (Cohen 1989). In input–output models, usually only the production accounts are endogenous (implying that changes in the level of expenditures directly follow a change in income), and the factor and household accounts are exogenous (implying that expenditures are set independently of income changes). In a SAM, the production factors, as well as the households' accounts, are endogenous. The exogenous or independent accounts can consist of payments to, and revenues from, the government, actors outside the research area, and investments, value added or savings.

Table 5.1 shows the elements of a (general) SAM. The first account is the Production accounts which are rather similar to an input–output table. The Production accounts describe how firms buy raw materials and intermediate goods (A_{11}). Furthermore, a SAM includes information about the costs of hiring factor services (A_{21}) to produce commodities (Y'_1). The exogenous part of the first column includes expenditures in the ROW, and value-added, of which part is paid to the government. The rows, which show the receipts, describe the sales to domestic intermediate industries (A_{11}), to final consumption of households (A_{13}), and to exports to the ROW(X_1). The sales to firms or households in the ROW form the exogenous accounts.

The Factor accounts include labour and capital accounts. The rows show received payments in the form of wages (A_{21}). Factor revenues, such as labour income and part of the profits, are distributed to households (A_{32}), after paying the corresponding taxes to the government. The exogenous part of the factor accounts includes payments to households in the ROW from town or hinterland industries, as well as wage payments of ROW industries to local households.

Finally, the Households' accounts include the factor incomes described above (A_{32}), as well as household expenditures on the local market (A_{13}). The exogenous part (X_3) describes direct taxes and the savings from households, as well as their consumption in the ROW.

5.1.4 Advantages and Disadvantages of SAM Analysis

A SAM is an analytical and predictive tool to represent and forecast system-wide effects of changes in exogenous factors. A great advantage of a SAM is its ability to capture a wide variety of developments in a (macro-) economy, as it links production, factor and income accounts. A large share of economic interactions takes place within the household sector, and a SAM disaggregates the cells involving 'returns for labour' and the household sector into smaller groups (such as different income groups) to show the effect of the different behaviour of these groups. Furthermore, it is a relatively efficient way of presenting data: the presentation of data in a SAM immediately shows the origin and destination of the various included flows. Another advantage is its usefulness as a tool to reconcile different data sources and fill in the gaps. This enables the reliability of existing data to be improved and inconsistencies in data sets of different nature and origin to be revealed. (Alarcon et al. 1991).

Most of the disadvantages of a SAM are similar to the disadvantages of input–output tables and concern the Production activities accounts. Important, and sometimes restrictive, assumptions made in the input–output model, as well as in the SAM, are that all firms in a given industry employ the same production technology (usually assumed to be the national average of input, output and labour for that industry), and produce identical products. Because the tables are produced only for a certain period, the model can become irrelevant as a forecasting tool when production techniques change. Other disadvantages are that the model assumes that there are no economies or diseconomies of scale in production or factor substitution, and that they do not incorporate the existence of supply constraints. In a rather static situation, these ceteris paribus conditions are a perfectly acceptable position which has demonstrated its great relevance in a long (spatial-) economic research tradition. However, in a highly dynamic context, with complex space-time system interactions, stable solution trajectories are less likely to occur (Nijkamp 2007). Finally, the production accounts are essentially based on a linear production technology: doubling the level of agricultural production will in turn double the inputs, the number of jobs, etc. This reveals something of the inflexibility of

the model. Thus, the model is entirely demand-driven, implying that bottlenecks in the supply of inputs are largely ignored (van Leeuwen et al. 2005).

There are also some practical problems in the development of a (local) SAM. The statistical estimation of a new matrix is very labour-intensive and expensive. This is mainly because much of the information is gathered with help of micro-survey questionnaires. Another problem with this method is that interviewees, firms, or households, are not able to give perfect answers. Sometimes they do not understand the question, or they do not want to tell the truth, and therefore the results are not always perfect. However, a SAM is still a very useful tool, in that it shows effects throughout the whole economy, linking the different accounts.

5.2 Regional SAM

5.2.1 From a National to a Regional Model

The construction of a SAM always involves the integration of data from different data sets. Data required for production accounts often come from input–output tables, and the distribution flows to institutions come from national income and expenditure accounts. Therefore, the majority of studies using SAMs concern the economies of single countries. Although an economic unit does not necessarily have to be a country, the national borders do provide a natural and artificial boundary for defining a macroeconomic unit (Round 1988). Often information is available at the national level, which makes it a lot easier to develop a national input–output table or SAM. However, many economic processes on a regional level are very different from those at the national level. Regional spatial or institutional differences can bring about important economic differences. Smaller regions, for example, are more dependent on trade with other areas, both for the sales of outputs (export) and for the purchase of inputs (import) (Miller and Blair 1985). Therefore, it is necessary to develop a regional SAM.

There are several ways to regionalize a national input–output table or a SAM. According to Isard et al. (1998), the more disaggregated a SAM needs to be, the more extensive are the data requirements. They state that the best way to build a regional SAM is to start with the regionalization of the Production activities' account using a national input–output table. The simplest way is to use a 'non-survey method'. Another way is to use the GRIT method: Generating Regionalized Input–output Tables. The GRIT method, developed by Jensen et al. (1979), has the advantage that it combines non-survey methods with survey methods. The GRIT system is designed to produce regional tables that are consistent in accounting terms with each other and with the national table. However, the developer is able to determine the extent of interference with the statistical processes by introducing primary or other superior data.

5.2.2 Interregional SAMs at Town-Hinterland Level

A specific classification and disaggregation of a SAM depends on the questions which the SAM methodology is expected to answer. In this case, the aim is to focus on the spatial interdependency of town and hinterland actors (see also Mayfield et al. 2005). This means that a bi-regional SAM has to be developed, describing both the town and its hinterland, which results in four systems of endogenous accounts (see also Appendix 5.1):

1. Linkages within the town
2. Linkages within the hinterland
3. Flows from town to hinterland
4. Flows from hinterland to town

For the generation of the interregional SAM, the most important data are the national input–output table and secondary data, such as number of firms or number of jobs, obtained from government institutions, as well as from (local) surveys (see Fig. 5.2).

When this information has been collected, the next step is to develop a regional input–output table by the use of GRIT. The GRIT method uses location quotients, which describe the regional importance of an industry compared with its national importance, by using output-ratios. Together with additional secondary data on commuting patterns and on production values, value added, employment level, savings, investments, imports, and exports, a regional input–output table describing zone A and another describing zone B can be generated.

However, the main structural difference between a (regional) input–output table and a (regional) SAM is the information on household expenditures, wages, employment, etc. Therefore, secondary data, together with information from the surveys on household groups and firm groups, need to be added and combined with the two regional input–output tables. After the regional SAM has been generated, expert opinions[1] can be requested to verify the cell values of the matrix.

Although, the development of the SAMs has proceeded with great care, it is important to keep in mind that the local focus of the models that have been built results in its own limitations. One of the major problems is the relatively small proportion of the total inputs and outputs from firm production that is retained within the local economy, resulting in small coefficients, making them more liable to statistical error. Another limitation is that the secondary data collected in the five countries (especially in Portugal and Poland) is not exactly the same (sometimes there were even no data available at all) (Mayfield et al. 2005), resulting in different creative solutions.

However, finally, 30 SAMs were developed (see Chap. 1, Appendix 1.1 for a list of towns), each consisting of 17 Production accounts, 4 Production factor accounts,

[1]In this case, local stakeholders (policy makers and persons who are acquainted with the local economy) were asked to verify the results.

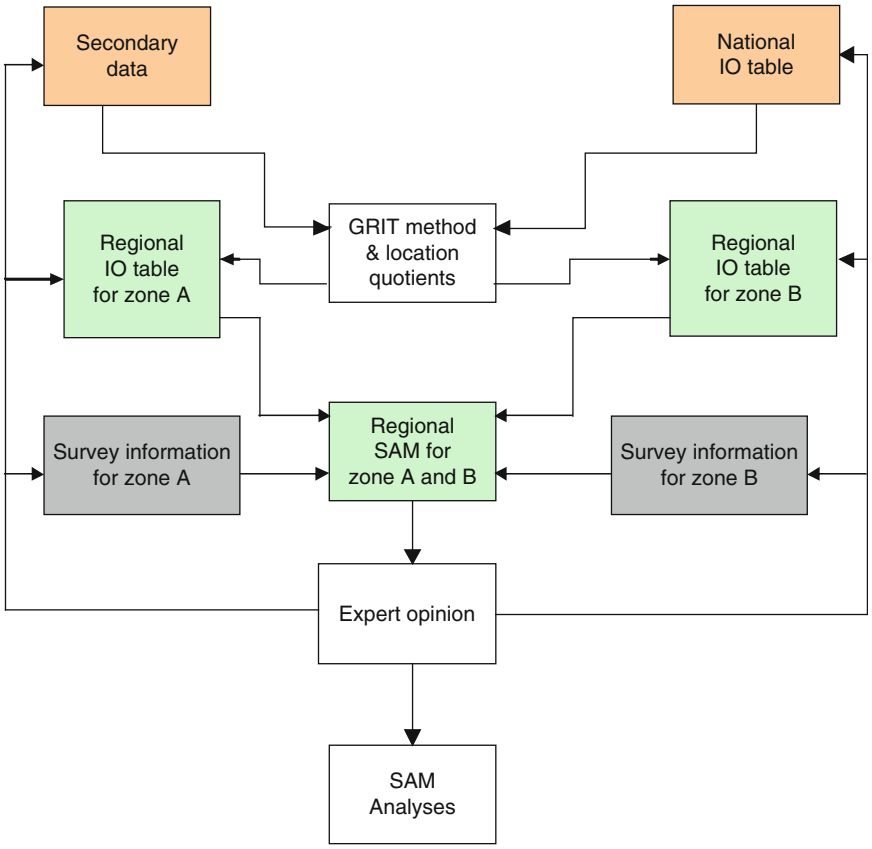

Fig. 5.2 Procedure to construct interregional SAMs
Source: Mayfield et al. (2005)

4 Household accounts and an Exogenous ROW account (see Appendix 5.2). Together, they form a very interesting and unique database, especially because they enable us to perform a thorough analysis and comparison of the economic structure of a set of towns located in five different European countries.

5.3 Economic Structure of Small and Medium-Sized European Towns

As mentioned in an earlier section, a SAM can be used both as an analytical and a predictive tool. In this section, we use an analytical application to explore the intra- and interregional monetary flows in order to gain better insight into the structure of the local economy.

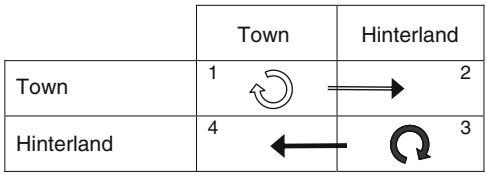

Fig. 5.3 Four systems of endogenous accounts (output-oriented)

Our interregional SAMs describe both the town and its hinterland resulting in four systems of endogenous accounts, as shown in Fig. 5.3: town-town (1); town-hinterland (2); hinterland-hinterland (3); and hinterland-town (4). The relative size of these four systems indicates the importance of either town or hinterland for the local economy, as well as the level of interaction.

5.3.1 Relative Importance of Town and Hinterland in the Local Economy

The importance of the hinterland compared with the town in the local economy depends on the definition and size of the hinterland. In this analysis, the hinterland is defined as a 7 km zone around the town. In order to be able to look at the relative importance of town and hinterland in the local economy (town + hinterland), the share of the four accounts in total local output has been derived. In this section, the exogenous accounts (ROW) are excluded from the analysis. Table 5.2 shows the relative sizes of the four systems for the small, the medium-sized, and all towns in the five European countries. It appears that, on average, the largest system is the town-town system, or the intraregional town flows. Only in the Netherlands and in Portugal are the intraregional hinterland flows larger. However, in all five countries, the expenditures from hinterland actors in town (4) are larger than the expenditures from town actors in the hinterland (2). This means that, in general, the total flow within and to the towns is larger than in opposite direction.

When focussing on the difference between small and medium-sized towns, it appears that, in general, the shares of the accounts are rather similar. However, the most important difference is that in small towns, in every country, the intraregional town flows are smaller and the intraregional hinterland flows larger compared with the medium-sized towns.

Surprisingly, on average, the size of the interregional accounts (2 and 4) are the same for small and medium-sized towns. Nevertheless, the national differences are apparent: In England and France, particularly the town actors' expenditures in the hinterland of small and medium-sized towns are relatively large (11–13%), while in Portugal, the hinterland actors' expenditures in small towns are much more significant (26%). But, in general, in all countries, in both small and medium-sized towns, the demand from the hinterland for the goods and services of the town is twice as much as vice versa.

Table 5.2 Relative share of the town-town, town-hinterland, hinterland-hinterland, and hinterland-town accounts in the total local output

	Small towns		Medium towns		Total	
	Town	Hinterland	Town	Hinterland	Town	Hinterland
England						
town	53	14	44	16	48	15
hinterland	13	37	5	35	9	36
France						
town	52	16	60	24	55	19
hinterland	11	20	6	11	9	16
Netherlands						
town	25	18	30	20	28	19
hinterland	4	52	10	40	7	46
Poland						
town	43	16	59	12	51	14
hinterland	7	34	7	23	7	29
Portugal						
town	25	26	31	19	28	22
hinterland	5	45	5	46	5	45
All towns						
town	40	19	45	18	42	18
hinterland	8	37	7	31	7	34

5.3.2 Importance of Sectors in the Total Production Output of the Local Economy

Another important analytical result from the SAM is the share of different sectors in the total output of the local area. In order to see which sectors produce most output, it was necessary to calculate the share in total output (including the exogenous accounts) of hinterland and town sectors related to agriculture, manufacturing and services (see Table 5.3). First of all, it appears that the share of agricultural output is not very large in any of the countries; on average, the sector produces 6% of the total output. However, in Poland the output is 12% of the total. Furthermore, in all countries, the share of agricultural output in medium-sized towns is lower than it is in the smaller towns (not in the table). In the small towns, this share is, on average, 10%.

From the table it also appears that, on average, most output is created by sectors located in town: both the services and manufacturing sectors each produce more than a quarter of the total output of the local economy. In England, the services sectors, both in town and hinterland, create as much as 63% of the total output. In France and in Poland, the manufacturing sectors in town produce the largest share of output, but at the same time, the other town sectors are important as well. In the Netherlands and Portugal, the hinterland sectors, both related to manufacturing and services, produce more.

Table 5.3 Share of sector outputs in the total production output of town and hinterland (together) in percentages

	England	France	Netherlands	Poland	Portugal	Average
Agriculture						
Town	–	–	–	–	–	–
Hinterland	4	3	7	12	6	6
Manufacturing						
Town	17	36	18	34	20	25
Hinterland	16	11	24	10	25	17
Services						
Town	41	29	19	31	21	28
Hinterland	22	20	32	10	27	22

Table 5.4 Share of total inputs bought and total outputs sold on the local market (town + hinterland)

	Town firms(%)	Hinterland firms(%)
Local outputs	27	15
Local input	20	27
of which labour (%)	39	41
Local outputs		
Agriculture	–	13
Manufacturing	32	21
Services	42	14
Local inputs		
Agriculture	–	34
Manufacturing	20	25
Services	22	25

5.3.3 Importance of Town and Hinterland for Firms in Selling Output and Obtaining Inputs

Besides the structure of the local economy, the SAM also includes information about the importance of the local economy to local firms. Table 5.4 shows the share of total production sold to the local economy (town + hinterland), as well as the share of total inputs obtained from the local area by town and hinterland firms. It appears that, in general, firms located in town sell more locally than hinterland firms do. This implies that, the hinterland firms buy a larger share of their inputs on the local market. An important input for many firms is labour. Around 40% of the local expenditures on inputs is paid for labour inputs. This is almost the same for town and hinterland firms. However, national differences are significant: in England firms only spend around 20% of all local expenditures on local labour, while in the Netherlands this is more than 60%. In most towns, the share of labour in total inputs is higher in medium-sized towns than in the smaller towns.

From an economic point of view, the agricultural sector is a valuable sector: it receives a relatively large share of payments from the ROW (by selling only 13% on

the local market), and it spends a relatively large share of it, 34%, on local inputs. For the other groups of sectors, the share of local inputs is rather homogenous.

The share of products sold on the local market differs much more with respect to the location and the kind of sectors. On average, town sectors sell 27% on the local market, and hinterland sectors 15%. Particularly the services sectors located in town sell a large share to the local actors: on average 42%. From the hinterland firms, the ones related to manufacturing sectors sell most to the local area. However, in this same group of sectors, the firms located in town also sell more locally.

Apparently, town firms 'use' the local area more as a place to sell their products, and hinterland firms use it as a place to obtain their inputs. However, in both areas, the firms pay 40% of their local expenditures to local labour.

5.3.4 Importance of Town and Hinterland to Local Households

The importance of town and hinterland to local households can best be explained by using income and expenditure figures. Therefore, the share of total income received from local employers, as well as the share of total expenditures spent in town, has been calculated. First of all, as can be seen in Table 5.5, both town and hinterland are important places for employment, and thus for generating local income. On average, half of the local household income is received from local employers. In most countries, the share of locally-earned income in the hinterland is higher compared with that in town. However, there are, of course, national differences: in England, only around a quarter of the income is earned locally, in Portugal almost all income is earned there.

The households, in general, spend more than a quarter of their total expenditures in the local area. These expenditures include everything: that is, insurance, holidays, transport, etc., as well as shopping. In all countries, the town households are the ones that spend most money locally.

From this first analysis of the 30 interregional SAMs, it appeared that only in the Netherlands and Portugal is the hinterland-hinterland account the largest account in the local economy. In the other three countries, the town-town account is larger. Furthermore, in all countries, the demand from hinterland actors for town products is twice as big as vice versa.

It appeared that the local area is especially important for town firms to sell their products, in particular for the service sectors. For the hinterland firms, the local area

Table 5.5 Household income and expenditures

	England	France	Netherlands	Poland	Portugal	Average
Income received from local employers (%)						
Town households	24	23	41	66	90	49
Hinterland households	25	38	67	54	88	54
Local expenditures of households (%)						
Town households	20	27	24	35	44	30
Hinterland households	18	25	20	17	41	24

is more important for buying inputs, in particular for the agricultural farms. Apart from that, the local area is an important place of work for the households: half of the income is earned locally. Furthermore, households buy around a quarter of all of their necessities in town or hinterland. Of course, there are national differences; in general, however, the local area is more important for Polish and Portuguese actors and less important for the English ones.

5.4 Multiplier Analysis

5.4.1 Introduction

SAMs, as I–O tables, can be used to construct multipliers based on the estimated re-circulation of spending within the region: recipients use some of their income for consumption spending, which then results in further income and employment. This 'multiplier effect' appears at three levels. First, the *direct effect* of (production) changes: for example, an increase in retail demand because of a growing population will directly increase the output of the retail industry. *Indirect effects* result from various rounds of the re-spending of, for example, retail receipts in linked industries, such as the wholesale or the food sector. This will have an indirect effect on these industries. The third level of effects is the *induced effect*. This effect only occurs when the household accounts are endogenous (which means that they respond to a change in income) as in a SAM. The induced effects include changes in economic activity resulting from household spending of income earned directly or indirectly. These households can, for example, be supermarket employees, who spend their income in the local economy (van Leeuwen et al. 2005).

The three most frequently-used types of multipliers are those that estimate the effects on: (1) outputs of the industries; (2) income earned by households because of new outputs; and (3) employment generated because of the new outputs. In this section, we focus on output and income multipliers. We look at the composition of the multipliers and identify key sectors for the town and hinterland economy.

5.4.2 Variations in Multiplier Values

The values of the multipliers can differ because of different factors. The size of the multipliers depends, first of all, on the choice of the exogenous and endogenous variables which, in turn, depend on the problem studied (Cohen 1999). Furthermore, the size depends on the overall size and economic diversity of the region's economy. Regions with large, diversified economies which produce many goods and services will have high multipliers, as households and businesses can find most of the goods and services they need in their own region. Smaller regions, such as cities or towns, will need to import more products and labour (imports can

be considered as leakage), resulting in lower multipliers. Regions that serve as central places for the surrounding area will have higher multipliers than more isolated areas. Besides this, the level of economic development is important. Economic theory predicts a higher share of government and more foreign trade at higher levels of economic development, leading to an expected lower output multiplier at a higher development level (Cohen 1999). Furthermore, the nature of the specific industries concerned can have a significant effect. Multipliers vary across different industries of the economy, based on the mix of labour and other inputs and the tendency of each industry to buy goods and services from within the region (less leakage to other regions) (van Leeuwen et al. 2005).

The value of SAM multipliers is higher compared with input–output multipliers because, besides capturing effects from production activities, they also include effects on factor and household incomes. The range of values of SAM output multipliers on a national scale lies between 2.1 and 5.5 (see Vogel 1994; Blane 1991; Cohen 1999; Archarya 2007). As expected, SAM output multipliers at a local or regional scale are usually lower, and have values between 1.3 and 2.3 (see Roberts 1998; Cohen 1996; Psaltopoulos et al. 2006). The income multipliers are generally lower compared with output multipliers: at a local scale the values typically range between 1.2 and 1.6.

5.4.3 Interregional SAM Multipliers at Town-Hinterland Level

In the Marketowns project, an interregional SAM model was constructed to represent flows of goods, services and labour between the town (one region), the hinterland (the other region) and the ROW, for each of the 30 towns. The methodology used to derive the local SAM multipliers is described in the final report of the project (Mayfield et al. 2005, p. 54 onwards). Here, we will only describe the composition of the multipliers.

As mentioned earlier in Sect. 5.2.2, the SAMs include four systems of endogenous accounts: town-town, hinterland-hinterland, town-hinterland, and hinterland-town flows. The total SAM multiplier is a product of three matrixes: M1, M2 and M3 (see Mayfield et al. 2005).

First of all, M1 is the intraregional multiplier matrix, depicting the linkage effects between endogenous accounts wholly within the actors' 'own region' (town or hinterland). Secondly, M2 can be interpreted as the multipliers for all the cross-flows between the town and hinterland. It captures the effects from the town on the hinterland, and vice versa. Thirdly, M3 indicates the 'closed loop' multiplier matrix. This matrix shows the effect that an injection into the town (or hinterland) has on itself through the endogenously defined linkages within the hinterland (or town).

Table 5.6 shows the M1 and M2 multipliers for a shock in the production sector, factor accounts, or household income.

Evidently, this methodology results in a great number of (sub-) multipliers (output, factor, and income) as well as the possibilities to show linkages between

Table 5.6 M1 and M2 output multipliers for town and hinterland (shock to production, factors, or household income)

		Production	Factor	Household	Production	Factor	Household
		Town			Hinterland		
Production	Town	$M1_{town}$ (output)	$M1_{town}$ (factor)	$M1_{town}$ (income)	$M2_{hinterland}$ (output)	$M2_{hinterland}$ (factor)	$M2_{hinterland}$ (income)
Factor							
Household							
		Town			Hinterland		
Production	Hinterland	$M2_{town}$ (output)	$M2_{town}$ (factor)	$M2_{town}$ (income)	$M1_{hinterland}$ (output)	$M1_{hinterland}$ (factor)	$M1_{hinterland}$ (income)
Factor							
Household							

town and hinterland. Our aim is to use the interregional SAMs to find out, for towns in five European countries, what the key-sectors in both town and hinterland economies are, and how strong are the linkages between production and households and between town and hinterland.

5.4.4 SAM Output Multipliers

SAM output multipliers show the adjustment in the towns' and hinterlands' total output that would be associated with a change of one unit of output from a certain sector. When, for example, the final demand for manufacturing products increases in town, this results in an effect in the production sectors in town, as well as in the production sectors in the hinterland. But these are not the only effects: there will also be an effect in labour factors, as well as in household incomes in town and hinterland. All these effects together, plus the 'closed loop' effect[2] sum up to the 'industry SAM output multiplier'.

5.4.4.1 Aggregated Output Multipliers

For each town, the output multiplier of 17 sectors in town and hinterland has been derived. Table 5.7 shows the average SAM output multiplier values of the aggregated agricultural, manufacturing and service-related sectors per country (average of six towns) (see Appendix 5.3 for the output multipliers per sector, per country and Appendix 5.4 for the multipliers for the Dutch towns individually). First of all, we can see that the hinterland multipliers have higher values than the town multipliers. This is in line with the findings from Sect. 5.4.2: first of all, in many areas, the total economic output in the town is larger than in the hinterland; and, secondly, local inputs are more important for hinterland firms (more indirect effects).

[2]For example, the effect of hinterland households who receive more income because of a shock to the town and who spend this extra income in a shop in town.

Table 5.7 Aggregated SAM output multipliers for five European countries

	England	France	Netherlands	Poland	Portugal	Average[a]
Town (zone A)						
Agriculture[b]	–	–	–	–	–	–
Manufacturing	1.39	1.36	1.29	1.26	1.20	1.30
Services	1.32	1.41	1.56	1.45	1.51	1.45
Hinterland (zone B)						
Agriculture[c]	1.25	1.28	1.52	1.94	1.65	1.53
Manufacturing	1.42	1.30	1.35	1.35	1.52	1.39
Services	1.44	1.44	1.57	1.50	1.66	1.52

[a]Average of the five country multipliers
[b]Agriculture is not part of the town economy
[c]Without forestry and fishing

Furthermore, it appears that the service multipliers have relatively high values; only in England is the output multiplier for the manufacturing sector in the town higher than the service multiplier. The explanation for this is that, in England (and to a lesser extent in France), the share of exogenous accounts in the total output of the manufacturing sectors is lower than for the service sectors.[3] Especially in the Netherlands and Portugal, the multiplier for the service sector is relatively high (both in town and in hinterland). The most important reason for this is the stronger effect on factor income and household income in the Netherlands; in Portugal, a stronger effect on the intermediary deliveries also plays a role.

In Poland and Portugal, the agriculture multipliers are relatively high. Especially in Poland this sector is still important: it produces 31% of the total output of the Polish hinterland (compared with around 12% in the other four countries). However, in Portugal and the Netherlands also, the agriculture multipliers are larger than the manufacturing multipliers. This can be explained by the relatively large share of local inputs.

The hinterland multipliers are generally higher and more heterogeneous compared with the town multipliers. This holds especially for Poland and Portugal. In Poland the effect on factor income is stronger in the hinterland. In Portugal, the main reason for higher multipliers in the hinterland is the stronger interregional effect on production activities located in the town.

5.4.4.2 Composition of SAM Output Multipliers

As explained earlier, an output multiplier is the sum of different effects taking place in the local economy as a result of an exogenous shock. Table 5.8 shows the disaggregation of the average output multiplier effects in town and hinterland on

[3]In the other three countries, the share of exogenous accounts (which includes payments to the ROW) in the service sectors is lower compared with those in the manufacturing sectors, resulting in higher service multipliers. However, in general, the share of exogenous accounts is very high in England and France (around 82%) compared with the other three countries (70% in the Netherlands and Poland and 65% in Portugal).

Table 5.8 The impact of a shock to production output[a] on production output, factor income, and household income accounts in town and hinterland (summing up to 100% which is the SAM output multiplier)

Impact of:	England (%)	France[b] (%)	Netherlands (%)	Poland (%)	Portugal (%)	Average (%)
Town shock on town output	67	61	23	47	41	48
Town shock on town factors	15	20	37	23	22	23
Town shock on town HH income	3	5	13	16	17	11
Total impact on zone A	86	86	73	85	80	82
Town shock on hinterland output	7	8	7	6	7	7
Town shock on hinterland factors	5	3	11	5	6	6
Town shock on hinterland HH income	2	0	9	4	8	4
Total impact on zone B	14	11	27	15	20	17
Hinterland shock on town output	9	26	20	29	32	23
Hinterland shock on town factors	8	10	10	5	4	7
Hinterland shock on town HH income	3	3	7	4	5	4
Total impact on zone A	20	40	37	38	40	35
Hinterland shock on hinterland output	65	39	14	15	15	30
Hinterland shock on hinterland factors	12	17	30	31	24	23
Hinterland shock on hinterland HH income	3	4	19	16	21	13
Total impact on zone B	80	60	63	62	60	65

[a]Average of 13 sectors in town (no agricultural sectors) and 17 sectors in the hinterland
[b]Without Ballancourt

the output, factor, and income accounts. It appears that there are some distinct differences between the distribution of effects in town and hinterland.

In general, more than 80% of a shock to the town is redistributed internally, of which around 50% goes to the town Production account, 20% to factor income and 10% to household income. An exception is the Netherlands, where the effect on the town Production account is much smaller (only 23%). Instead, the effect on town (labour) factors is relatively high.

A shock to the hinterland production output generally results in around 'only' 65% of this output being redistributed to the hinterland itself and 35% to the town economy. This indicates (again) that the hinterland-town linkages are stronger than vice versa. Of this 65% that is redistributed in the hinterland, 30% goes to the production accounts, 23% to factor income, and around 13% to household income. Furthermore, a significant part of the effect affects the town production accounts (23%). This is line with the findings of Hidayat (1991), who developed a two-regional SAM for Indonesia (urbanized centre region and the outer islands).

He also found that the urbanized area shows higher intra-multipliers and the hinterland higher inter-multiplier values.

As in the Dutch towns, the effect of the shock on the Dutch hinterland factors is also relatively strong. In Portugal, the effect on household income is particularly significant: 29% of the total multiplier effect. This means that every €100 extra production in an average sector results in an extra income of €29 for town and hinterland households. Conversely, the effect of a shock in the English and French production output results only in minor household income effects, around 3–5% in both town and hinterland.

This multiplier analysis also shows that, in England, the interregional linkages are weaker than in the other countries; the effect on the town from a hinterland shock is relatively small (only 20%). In the Netherlands, the strongest interregional linkages are found, mostly through factor income. In Poland and Portugal, the hinterland is especially dependent on intermediary deliveries from the towns. Although differences between the sectors are minor, on average the strongest links are found in the manufacturing sectors, both in town and hinterland.

5.4.4.3 Key-Sectors

In many (multiplier) studies, an indication of which sectors could be considered as key-sectors has been given. These key-sectors can be defined as 'above average contributors to the economy' from either an ex-post or an ex-ante perspective (Sonis et al. 1995). There has been a long debate about the best way to identify these kinds of sectors, which was initiated by Rasmussen (1958) and Hirschman (1958). The Rasmussen/Hirschman indices (derived from the Leontief inverse (multiplier) matrix) were used to show how the internal structure of the economy behaved, but without taking into consideration the level of production in each sector. Later, Cella (1984) and Clements (1990) added this notion to their method of analysing the productive structure of regions. However, as Sonis et al. (1995) describe, the concept and the determination of key sectors in an economy can be presented in different ways, because the multiplicity of objectives that characterize the growth and development of most regions makes it implausible that a small number of sectors would be able to achieve all of them.

In this analysis, we define key sectors as sectors with above average (local) forward and backward linkages which contribute significantly to the local economy. This means that key-sectors have both high output multipliers and a high share in total town or hinterland production output. To be able to identify them, Fig. 5.4 has been developed. This figure shows on the x-axis the average output multiplier values of 17 sectors in the 30 European towns and their hinterland, together with on the y-axis the average share of output of these sectors in the total town or hinterland output (see Appendix 5.5 for the key-sectors of each country).

On average, the output multipliers range from 1.2 to 1.7, and the share in total output ranges from 1 to 16%. The sectors in the top-right square of the figure, with multipliers higher than 1.35 and a relatively high share in total output of more than 8% can be considered as key-sectors.

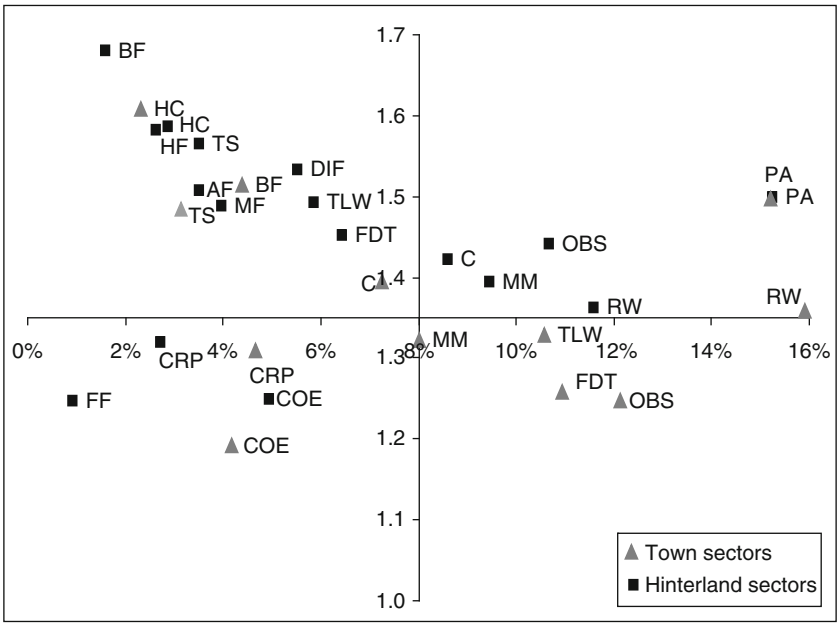

Fig. 5.4 Defining key-sectors: scatter of average output multipliers (x-axis), together with their share of production in total output (y-axis) for all towns together. AF = Arable farming; DIF = Dairy and intensive farming; HF = Horticulture; MF = Mixed farming; FF=Forestry and fishing; COE = Coal, oil and gas, metal ore, electricity; FDT = Food, drink and tobacco; CRP = Chemicals, rubber, plastics, glass; MM = Metals, machinery, electrical, computing, transport equipments; TLW = Textiles, leather, wood, furniture; C = Construction; TS = Transport Services; RW = Retail and wholesale; HC = Hotels and catering; BF = Banking and financial services; OBS = Other Business services; PA = Public administration, education, health, other services

It appears that, when looking at all 30 towns together, one sector can quite clearly be seen as a key-sector. This is the 'public administration, education and health' (PA) sector. With an average multiplier of 1.5 and 16% of total town or hinterland output, this sector would be a very good sector in which to invest (public) money in order to increase both the local town and hinterland economy, particularly in Portugal, Poland, in the English hinterland, and to a lesser extent in the Netherlands. Another important sector in both town and hinterland is the retail and wholesale (RW) sector, which can particularly be considered as a key-sector in Poland, the Netherlands, and the French towns. Besides these two service sectors, 'other business services' (OBS) can also be considered as a key-sector for the hinterland economy, particularly in France and England.

When thinking about key-sectors of rural areas, often tourism-related services, such as the hotel and catering sector, as well as the banking and financial services are indicated (see Courtney et al. 2007). However, according to Fig. 5.4, although these sectors do have high multipliers, their contribution to local output is limited. Therefore, according to our definition, these sectors cannot be seen as key-sectors. Nevertheless, they can have a significant impact on local employment and therefore be of importance.

The agricultural sectors also have relatively high multipliers, but on average a limited production output. Only in Poland can mixed farming (MF) and dairy and intensive farming (DIF) be regarded as key-sectors with a multiplier higher than 1.8 and a production output of more than 10% each.

For the town economy, it appears that there are not many manufacturing sectors which can be seen as key-sectors. Only in France do the food, drink and tobacco sector (FDT), the metals and machinery (MM) sector, and the textiles, leather, wood and furniture (TLW) sector have both high multipliers and produce a significant share of the total town output. In most other towns, these sectors do produce a significant share as well, but the multiplier values are lower.

It appears that, nowadays, in small and medium-sized towns, the service-related sectors have also become very important for the local economy: in general, the public administration, education and health sector, as well as the retail and wholesale sector can be considered as key sectors in town and hinterland. In the hinterland, the manufacturing sectors are more important, with the metals and machinery (MM) sector and the construction (C) sector as two of the key-sectors.

5.4.5 SAM Income Multipliers

SAM household income multipliers reflect the impact on the regional economy of an injection into household incomes. In the interregional SAMs, the households are divided into four income groups (25% groups). Income group 1 receives the least income, Income group 4 the most. The exact amount of income per household group differs between the five countries because the division is based on the average level of income in a specific country.

Table 5.9 shows the average SAM income multipliers per country, and Table 5.10 the average value for the four different income groups per country.[4] From the literature, we know that the values of income multipliers are generally lower compared with output multipliers. For England, France and the Netherlands, Table 5.9 shows values in line with values found in the literature (between 1.2 and 1.6). However, in Portugal and Poland, the values are higher, even 2.11 for the low incomes in the Polish towns.

Earlier, in Sect. 5.3, it appeared that particularly the Polish and Portuguese (town) households buy a large amount of necessities in the local economy. Furthermore, more than two-thirds of these households have a job in the local area, which means that they also profit from the induced effects. The reason why there is a higher income multiplier for the town households is that, in all countries, these households buy more products and services locally.

Interestingly, from Table 5.10 it appears that, in all countries, both in town and hinterland, the lower the income, the higher the multiplier effect. Households with high income more often have a job outside the local area. Furthermore, the

[4]See Appendix A5.V for the multipliers for each of the Dutch towns.

Table 5.9 Average household income multipliers in town and hinterland for five European countries

	England	France	Netherlands	Poland	Portugal	Average
Town (zone A)	1.30	1.44	1.39	1.58	1.71	1.48
Hinterland (zone B)	1.28	1.35	1.35	1.48	1.69	1.43

Table 5.10 SAM Household income multipliers in town and hinterland for 5 European countries

	England	France	Netherlands	Poland	Portugal	Average
Town (zone A)						
Income group 1	1.40	1.63	1.57	2.11	1.78	1.70
Income group 2	1.34	1.50	1.44	1.56	1.97	1.56
Income group 3	1.28	1.30	1.30	1.23	1.70	1.36
Income group 4	1.18	1.31	1.22	1.41	1.39	1.30
Hinterland (zone B)						
Income group 1	1.40	1.37	1.59	1.83	1.83	1.60
Income group 2	1.30	1.47	1.36	1.76	1.79	1.53
Income group 3	1.26	1.31	1.27	1.24	1.77	1.37
Income group 4	1.18	1.27	1.17	1.07	1.37	1.21

behavioural shopping model for the Dutch households (described in Chap. 3), also shows that richer households are less likely to shop in town or hinterland.

Table 5.11 shows a further disaggregation of the total SAM household income multipliers. The upper half of the table shows the effects of a shock on the income of town households, the lower half the effects of a shock on the income of hinterland households. In all countries, the largest impact from a shock on town households' income is on the town's production output. In Poland, this is on average 85%, and at the same time there is a relatively weak impact on the hinterland's output. In the Netherlands the share of the impact on town output is 'only' 71%, mainly because of a relatively strong impact on town factors.

The underlying data indicates that these patterns of impact are not significantly different for the different income groups (1–4). So, although the absolute multiplier values decrease for the higher incomes, the spread of impact over the six SAM accounts is nearly the same.

Surprisingly, this does not hold for the hinterland households. Here we find that, although in absolute (multiplier) terms the impact on all town and hinterland accounts decreases significantly when the income gets higher, in relative terms the impact on town output gets stronger and on hinterland output weaker when the level of household income gets higher. So, in relative terms, a shock to higher (hinterland) income groups results in a stronger impact on town output. Only in the Netherlands does a shock to any of the 4 income groups result in a stronger impact on the hinterland output than on the town output (see Table 5.10). In England and Portugal, only a shock to the group of households with the lowest income results in a stronger effect on the hinterland production output. In all other cases, around 60% of the total impact of a shock on the income of hinterland households is on the town's output, and only around 30% is on the production output in the hinterland.

Table 5.11 The impact of a shock to household income (average of 4 income groups) on production output, factor income and household income in town and hinterland (summing up to 100% which is the SAM household income multiplier)

Impact of:	England (%)	France (%)	Netherlands (%)	Poland (%)	Portugal (%)	Average (%)
Town shock on town output	81	79	71	85	73	78
Town shock on town factors	3	4	9	5	5	5
Town shock on town HH incomes	1	1	3	4	4	3
Total impact on zone A	86	83	83	94	83	86
Town shock on hinterland output	12	14	11	4	12	11
Town shock on hinterland factors	2	2	4	2	2	2
Town shock on hinterland HH incomes	1	1	3	1	2	2
Total impact on zone B	14	17	17	6	17	14
Hinterland shock on town output	57	65	35	60	47	53
Hinterland shock on town factors	3	3	5	3	3	3
Hinterland shock on town HH income	1	1	2	2	3	2
Total impact on zone A	61	69	42	65	54	58
Hinterland shock on hinterland output	37	28	49	29	39	36
Hinterland shock on hinterland factors	2	2	6	3	4	3
Hinterland shock on hinterland HH incomes	1	1	4	2	4	2
Total impact on zone B	39	31	58	35	46	42

Summarizing, it appears that especially in Poland and Portugal the household income multipliers are relatively high. This is mainly because of strong effects on the production output. Furthermore, we can conclude that the higher the level of income of households, the lower the SAM income multiplier. Finally, we found that, in general, most of the impact of a shock to the income of households, living either in town or hinterland, goes to town production output. The only exception is the Netherlands, where a shock to the income of hinterland households also results in a strong effect on the production output in the hinterland.

5.5 Conclusions

This chapter has focused on the results derived from 30 interregional (town and hinterland) SAMs in five European countries. The aim was to find out in which countries strong linkages, and thus high multiplier values, appear, what are the key sectors for town and hinterland economies, and to what extent town and hinterland are linked.

As mentioned, a SAM can be used both as an analytical and a predictive tool. First of all, we explored the intra- and interregional monetary flows to get better insight into the structure of the local economy. When focusing on the local economy (without the exogenous ROW accounts), it appears that, in the Netherlands and Portugal, the largest monetary flows are the ones between hinterland actors: the intraregional hinterland account is the largest account of the local economy. In the other three countries, on average, the flows between town actors (the intraregional town account) are larger. In all countries, the demand from hinterland to town (interregional account) is twice as large as the demand from town to hinterland: in general, the town actors sell more, and the hinterland actors buy more, in the local area.

When focusing on the total output of town and hinterland firms (including imports from and exports to the ROW), it was found that in general, the town sectors – both services and manufacturing sectors – produce more than hinterland sectors. Only in the Netherlands and Portugal is the production in the hinterland larger. Furthermore, most output in the local area (town + hinterland) is produced by the service-related sectors: in the English towns this is as much as 63% of total output.

But how important is the local area to the firms? We found that, on average, the town firms buy 20% of their inputs on the local market, and the hinterland firms 27%. Furthermore, the town firms sell 27% of their output on the local market, and the hinterland firms 15%. This shows that town firms 'use' the local area more as a place to sell their products. In particular, firms from the town services sectors sell 42% of their output locally. The hinterland firms use the local area more as a place to acquire inputs. This holds particularly for the agricultural sectors.

Nevertheless, both in town and hinterland around 40% of local expenditures are used to pay for local labour, and in the Netherlands this is as much as 60%. This shows that both town and hinterland are important places for employment, and thus for generating local income. However, there are, of course, national differences: in England, only around a quarter of the income is earned locally, in Portugal almost all income. In their turn, the households, in general, spend more than a quarter of their total expenses (including mortgages, insurance, holidays, transport, etc.) in the local area.

As well as these analytical results, the SAM analysis also generates multipliers which can be used as a more predictive tool. Multipliers show the effect of the recirculation of spending within the region; recipients use some of their income for consumption spending, which then results in further income and employment. In general, if final demand in a sector increases, half of the multiplier effect is distributed to the Production accounts, 30% to the Labour accounts, and the rest (around 20%) to household income. Only in the Netherlands is the effect on labour stronger than the effect on production activities. In France and England, the linkage between local production and local income is the weakest.

We also found that, in general, the highest output (measuring the effect of extra demand in output) and income (measuring the effect of increasing income) multipliers are found in Poland and Portugal. In these countries, strong linkages exist between local production activities, as well as between households and local production. This is an indication that in less developed countries rural areas are still relatively isolated, leading to smaller leakages in rural economies. In England and France, the multipliers are relatively low, and in the Netherlands in-between.

In all five countries, the service-related sectors generate the highest output multipliers. Only in the English towns (not in the hinterland) are the manufacturing multipliers higher, and in the Polish hinterland the agriculture multipliers.

Furthermore, the hinterland multipliers are in general higher than the town multipliers. An important reason for this is the stronger linkage between hinterland and town than vice versa: the hinterland firms obtain a relatively larger part of their inputs from the towns. This implies that investments (or subsidies) in hinterland activities, preferably in service-related activities, leads to relatively large local effects.

Another important result is the identification of key-sectors in the local economy. These sectors have both high multiplier values and produce a relatively large share of total output. This means that creating more demand in key-sectors will lead to an above average (extra) effect in the specific area. It appeared that in all towns the service-related sectors are the sectors of the future: in general, the public administration, education and health sectors, as well as the retail and wholesale sector can be considered as key sectors for both town and hinterland. In addition, in the hinterland two manufacturing sectors can also be considered as key-sectors; the metals and machinery sector and the construction sector.

Obviously, households are also part of the macro-economy. In Poland and Portugal, the income multipliers are significantly higher than in the other three countries. This is because Polish and Portuguese (town) households buy a large amount of necessities in the local economy. Furthermore, more than two-thirds of these households have a job in the local area, which means that they also profit from the induced effects (see also Chap. 3).

In all countries, we found a higher multiplier for town households than for hinterland households. The explanation for this is that, in all countries, these town households buy more products and services locally. Furthermore, it appears that, both in town and hinterland, the lower the income, the higher the multiplier.

From this analysis, we can conclude that, in general, town sectors produce more than hinterland sectors. Although town sectors sell a relatively large share of their output on the local market, they acquire most of their inputs from somewhere else in the world. This results in lower output multipliers compared with the hinterland sectors, which buy a relatively large share of their input in town. We can also conclude that the hinterland is still more or less dependent on the town, rather than the other way around.

Important sectors to the local economy are the public administration, education and health sector, as well as the retail and wholesale sector. In addition, in the hinterland the metals and machinery sector, as well as the construction sector, are also relatively important.

We can also conclude that there are significant national differences. In England, and to a lesser extent in France, the linkage between town and hinterland is weaker, as well as the production-income linkage; these firms have more employees from outside the local area. In the Netherlands, the linkages between town and hinterland are much stronger but the towns are relatively less important. However, both town and hinterland are especially important for the provision of labour.

Appendix 5.1: Format of inter-regional Marketowns SAM (53×53)

	Zone A (town)			Zone B (hinterland)			Exogenous accounts	Total
	Production	Production labour income	Households	Production	Production labour income	Households		
Zone A (town)								
Production	A1 Town inter-industry matrix	B1	C1 Town household expenditures on town goods and services (g&s)	D1 Exports from town sector output to hinterland	E1	F1 Hinterland household expenditures on town (g&s)	G1 Export from town sector output to ROW, ROW household consumption on town g&s	H1 Total output value of town production
Production labour income	A2 Wage payments by town sector output to town labour income	B2	C2	D2 Wage payments by hinterland sector output to town labour income	E2	F2	G2 Wage payments by ROW sector output to town labour income	H2 Total factor payments to town
Households	A3	B3 Payments to town households from town sector output	C3	D3	E3 Payments to town households from hinterland sector output	F3	G3 Government transfers to town households	H3 Total town households income

(*continued*)

Appendix 5.1 (continued)

	Zone A (town)			Zone B (hinterland)			Exogenous accounts	Total
	Production	Production labour income	Households	Production	Production labour income	Households		
Zone B (hinterland)								
Production	A4 Export from hinterland sector output to town	B4	C4 Town household expenditures on hinterland (g&s)	D4 Hinterland inter-industry matrix	E4	F4 Hinterland household expenditures on hinterland (g&s)	G4 Export from hinterland sector output to ROW, ROW household consumption on hinterland g&s	H4 Total output value of hinterland production
Production labour income	A5 Wage payments by town sector output to hinterland labour income	B5	C5	D5 Wage payments by hinterland sector output to hinterland labour income	E5	F5	G5 Wage payments by ROW sector output to hinterland labour income	H5 Total factor payments to hinterland
Households	A6	B6 Payments to hinterland households from town sector output	C6	D6	E6 Payments to hinterland households from hinterland sector output	F6	G6 Government transfers to hinterland households	H6 Total hinterland household income

Exogenous accounts	A7 Indirect taxes, VAT, subsidies, imports from ROW of town sector output	B7 Payments to households in ROW from town sector output	C7 Savings/ direct taxes of town households	D7 Indirect taxes, subsidies, imports from ROW of hinterland sector output	E7 Payments to households in ROW from hinterland sector output	F7 Savings / taxes of hinterland households	G7	H7
Total	A8 Total input value of town sector output	B8 Total factor payments of town	C8 Total town household expenditure	D8 Total input value of hinterland sector output	E8 Total factor payments of hinterland	F8 Total hinterland household expenditure	G8	H8

Source: Mayfield et al. 2005

Appendix 5.2: List of accounts in inter-local SAMs of Marketowns

Production account:
1. Arable farming
2. Dairy farming
3. Arable farming, Intensive farming
4. Horticulture-open ground
5. Horticulture-glass
6. Forestry and fishery
7. Mining of coal, oil and gas
8. Other mining (sand, clay, salt etc)
9. Chemical products
10. Food manufacturing
11. Textiles, leather
12. Wood, furniture
13. Paper, offset printing
14. Rubber, plastic, glass
15. Metals, machines
16. Electric apparatus, computers, optical equipment
17. Transport equipment
18. Electricity, water
19. Construction
20. Wholesalers
21. Retailers
22. Hotels, restaurants and catering
23. Transport services
24. Bank, finance and insurance services
25. Real estate, other business services
26. Public administration, education, health, recreation, culture
27. Personal services

Production factor account:
1. Labour income management/professional
2. Labour income skilled/partly or unskilled non-manual
3. Labour income skilled manual
4. Labour income partly or unskilled manual

Households account:
1. 1st 25%-income group
2. 2nd 25%-income group
3. 3rd 25%-income group
4. 4th 25%-income group

Exogeneous account:
1. Sum of *rest of world account* (imports/exports), *government account* (taxes/subsidies) and *capital account* (savings/investments).

Appendix 5.3: Output multipliers per sector for town and hinterland in five European countries

	England	France	Netherlands	Poland	Portugal	Average
Town (zone A)						
Arable farming	–	–	–	–	–	–
Dairy and intensive farming	–	–	–	–	–	–
Horticulture	–	–	–	–	–	–
Mixed farming	–	–	–	–	–	–
Forestry and fishing	**1.39**	1.00	1.00	1.23	**1.47**	**1.22**
Coal, oil and gas, metal ore, electricity	**1.48**	**1.37**	1.00	1.10	1.01	1.19
Food, drink and tobacco	**1.34**	**1.44**	1.22	1.22	1.06	1.26
Textiles, leather, wood, furniture	**1.48**	1.36	1.36	1.24	1.21	1.33
Chemicals, rubber, plastics, glass	**1.43**	**1.44**	1.19	1.38	1.10	1.31
Metals, machinery, electrical, computing, transport equipments	**1.46**	1.31	1.33	1.25	1.25	1.32
Construction	1.13	1.27	**1.64**	1.38	**1.57**	**1.40**
Transport services	1.36	**1.66**	1.55	1.55	1.31	1.48
Wholesale/retail	1.10	1.34	**1.58**	**1.51**	1.27	1.36
Hotels and catering	1.19	1.62	**1.89**	1.55	**1.78**	**1.61**
Banking and financial services	**2.12**	**1.61**	1.43	1.19	1.24	1.52
Other Business services	1.02	1.07	1.31	1.28	**1.56**	1.25
Public administration, education, health, other services	1.14	1.16	1.61	**1.65**	**1.92**	1.50
Hinterland (zone B)						
Arable farming	1.27	1.13	1.48	**1.76**	**1.89**	1.51
Dairy and intensive farming	1.22	1.17	**1.73**	**1.81**	**1.74**	1.53
Horticulture	1.11	1.64	1.45	**1.83**	**1.89**	**1.58**
Mixed farming	1.40	1.19	1.41	**2.37**	1.07	1.49
Forestry and fishing	1.08	1.00	1.18	1.36	**1.62**	1.25
Coal, oil and gas, metal ore, electricity	**1.44**	1.29	1.06	1.13	1.33	1.25
Food, drink and tobacco	1.43	1.42	1.44	**1.62**	1.36	**1.45**
Textiles, leather, wood, furniture	1.43	1.40	**1.58**	1.36	**1.68**	**1.49**
Chemicals, rubber, plastics, glass	**1.47**	1.16	1.36	1.17	**1.45**	1.32
Metals, machinery, electrical, computing, transport equipments	**1.55**	1.22	1.29	1.46	1.45	1.39
Construction	1.17	1.32	1.40	1.35	**1.87**	1.42
Transport services	1.29	1.60	1.47	**1.67**	**1.79**	1.57
Wholesale/retail	1.31	1.31	**1.51**	1.39	1.30	1.36
Hotels and catering	1.15	1.54	**1.81**	1.57	**1.86**	1.59
Banking and financial services	**2.44**	1.65	1.44	1.60	1.28	**1.68**
Other Business services	1.20	1.39	1.47	1.30	**1.85**	1.44
Public administration, education, health, other services	1.27	1.14	**1.72**	1.49	**1.88**	1.50

Relatively high multipliers in bold

Appendix 5.4: SAM multiplier analysis of the Dutch towns

In the main text, we found that, in the Netherlands, compared with the other countries, especially the multiplier values of the services sectors in town are relatively high. Identified key-sectors were the hotel and catering sector, as well as public administration. In this section, we will have a closer look at the selected Dutch towns to see whether this picture holds for all towns or whether there are exceptions.

Output Multipliers

Table 5.12 shows the SAM output multipliers for aggregated sectors agriculture, manufacturing, and services, as well as for sectors with the highest multiplier values.

From Table 5.12 it appears that, in all towns, the service multiplier is higher than the manufacturing multiplier. As well as in Schagen, high service multipliers are

Table 5.12 Output multipliers of aggregated sectors, as well as for the sectors with the highest multiplier values for the six Dutch towns

	Dalfsen	Schagen	Bolsward	Nunspeet	Oudewater	Gemert	Average
Town (zone A)							
Agriculture	–	–	–	–	–	–	–
Dairy and intensive farming	–	–	–	–	–	–	–
Manufacturing	1.25	1.40	1.39	1.36	1.19	1.16	1.29
Textiles, leather, wood, furniture	1.32	1.24	1.47	1.74	1.18	1.18	1.36
Construction	2.01	1.81	1.79	1.33	1.61	1.26	1.64
Services	1.42	1.66	1.63	1.61	1.58	1.47	1.56
Retail Services	1.69	2.12	2.11	1.79	2.26	1.95	1.99
Hotels and catering	1.41	1.71	2.27	2.42	1.48	2.08	1.89
Hinterland (zone B)							
Agriculture	1.57	1.61	1.40	1.55	1.26	1.74	1.52
Dairy and intensive farming	1.58	1.97	1.86	1.72	1.53	1.71	1.73
Manufacturing	1.41	1.37	1.41	1.33	1.21	1.40	1.35
Textiles, leather, wood, furniture	1.70	1.71	1.74	1.23	1.42	1.70	1.58
Construction	1.48	1.43	1.40	1.26	1.17	1.63	1.40
Services	1.55	1.55	1.61	1.57	1.21	1.87	1.56
Retail Services	1.74	1.77	1.83	1.92	1.59	2.45	1.88
Hotels and catering	2.08	2.02	1.90	–	1.39	2.50	1.81

also found in Nunspeet and Bolsward. Both these towns have a high level of employment in the tourism sector, which explains that particularly the town multipliers related to hotels and catering activities have high values (2.27 for Bolsward and 2.42 for Nunspeet). In Schagen and Bolsward, the town manufacturing multipliers are also relatively high, partly because of a strong effect in the construction sector. This manufacturing sector has particularly strong local linkages when it is located in the town; the multipliers are generally much lower in the hinterland. In Oudewater, the town manufacturing multipliers are relatively low, as are the average town services multipliers. Only the retail service is related to a high value: 2.26.

When focusing on the hinterland, we see that the two towns with a relatively large share of employment in the agricultural sector, Dalfsen and Schagen, have relatively high agricultural multiplier values. However, the highest agricultural multiplier is found in Gemert. In this town, particularly mixed and intensive farming is important. In (almost) all towns, the average agricultural multiplier is higher than the average hinterland manufacturing multiplier. Again, especially in Oudewater this value is relatively low. This also holds for the services sector. On average, the hinterland multipliers of Oudewater are the lowest of those for the six towns. This can be explained by the location of Oudewater in relation to the bigger cities of Woerden and Gouda and the large city of Utrecht.

Income Multipliers

When we focus on the income multipliers (see Table 5.13), it appears that the differences between the towns are relatively small. However, on average, the highest multipliers appear in Schagen, both in town and hinterland, and in Oudewater, but only in town.

Table 5.13 Income multipliers for the six Dutch towns

	Dalfsen	Schagen	Bolsward	Nunspeet	Oudewater	Gemert	Average
Town (zone A)							
Income 1	1.65	1.65	1.57	1.34	1.64	1.57	1.57
Income 2	1.28	1.49	1.49	1.56	1.43	1.42	1.44
Income 3	1.19	1.37	1.26	1.32	1.45	1.22	1.30
Income 4	1.24	1.24	1.25	1.19	1.24	1.19	1.22
Average	1.34	1.44	1.39	1.36	1.44	1.35	1.39
Hinterland (zone B)							
Income 1	1.64	1.51	1.69	1.55	1.53	1.61	1.59
Income 2	1.26	1.56	1.34	1.25	1.35	1.36	1.36
Income 3	1.24	1.42	1.19	1.31	1.16	1.29	1.27
Income 4	1.13	1.22	1.12	1.22	1.17	1.17	1.17
Average	1.32	1.43	1.34	1.34	1.30	1.36	1.35

Table 5.14 Employment multipliers for key employment sectors

	Dalfsen	Schagen	Bolsward	Nunspeet	Oudewater	Gemert	Average
Town (zone A)							
Agriculture	–	–	–	–	–	–	–
Dairy and intensive	–	–	–	–	–	–	–
Manufacturing	1.11	1.33	1.57	1.25	1.25	1.08	1.27
Food and drinks	1.48	1.26	1.58	1.37	1.02	1.01	1.29
Textiles	1.02	1.22	1.03	1.18	1.34	1.06	1.14
Services	1.04	1.16	1.18	1.17	1.08	1.04	1.11
Transport services	1.02	1.33	1.48	1.03	1.41	1.04	1.22
Banking	1.01	1.45	1.50	1.66	1.01	1.06	1.28
Hinterland (zone B)							
Agriculture	1.23	1.18	1.26	1.24	1.14	1.10	1.19
Dairy and intensive	1.35	1.34	1.34	1.33	1.15	1.16	1.28
Manufacturing	1.10	1.20	1.24	1.30	1.17	1.10	1.18
Food and drinks	1.22	1.61	1.73	1.48	1.50	1.03	1.43
Textiles	1.19	1.32	1.23	1.42	1.07	1.18	1.24
Services	1.11	1.11	1.09	1.13	1.06	1.02	1.09
Transport services	1.05	1.02	1.10	1.30	1.14	1.02	1.11
Banking	1.31	1.48	1.04	1.19	1.03	1.02	1.18

Employment Multipliers

During the analysis, we also derived employment multipliers. These multipliers indicate the additional employment generated in the regional employment as a result of an initial employment increase in a particular sector. The employment multipliers are derived from a combination of output multipliers and direct employment coefficients (employment per sector output) (see Mayfield et al. 2005, p. 57). We show these multipliers on this town level, instead of on the national level, in the main text because on a town level they can be better interpreted.

Table 5.14 shows the employment multipliers for each town of those sectors with high multiplier values. Both in town and hinterland, on average, the food and drinks sector has the highest employment multiplier. This holds particularly for Bolsward, where a few large liqueur producers are located. The service sectors have lower multipliers, although the banking sector in Nunspeet has a multiplier of 1.66. In this town, apart from the normal banking facilities, there is also a regional office.

In the hinterland, a clear distinction between the two towns in more urbanized areas, Oudewater and Gemert, and the other towns appears when focusing on the Dairy and intensive sector. In Oudewater and Gemert, this multiplier is much lower.

Appendix 5.5: Key-sectors in town and hinterland

Abbreviations for sectors:

Arable farming	AF	Metals, machinery, electrical, computing, transport equipments	MM
Dairy and intensive farming	DIF	Construction	C
Horticulture	HF	Transport services	TS
Mixed farming	MF	Retail and wholesale	RW
Forestry and fishing	FF	Hotels and catering	HC
Coal, oil and gas, metal ore, electricity	COE	Banking and financial services	BF
Food, drink and tobacco	FDT	Other Business services	OBS
Textiles, leather, wood, furniture	TLW	Public administration, education, health, other services	PA
Chemicals, rubber, plastics, glass	CRP		

See Figs. 5.5–5.9

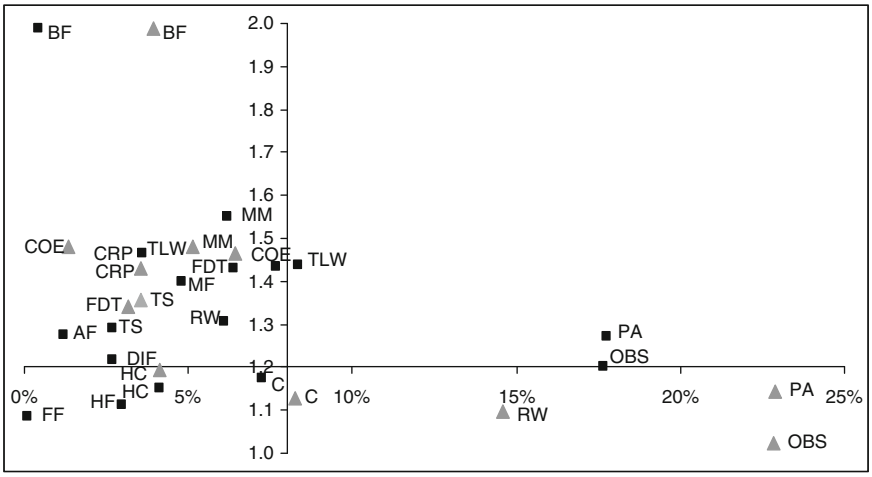

Fig. 5.5 Key sectors for English town and hinterland. *Filled triangle* = Town sectors, Filled square = Hinterland sectors, *X-axis* = multiplier value, *Y-axis* = share of sector output in total output

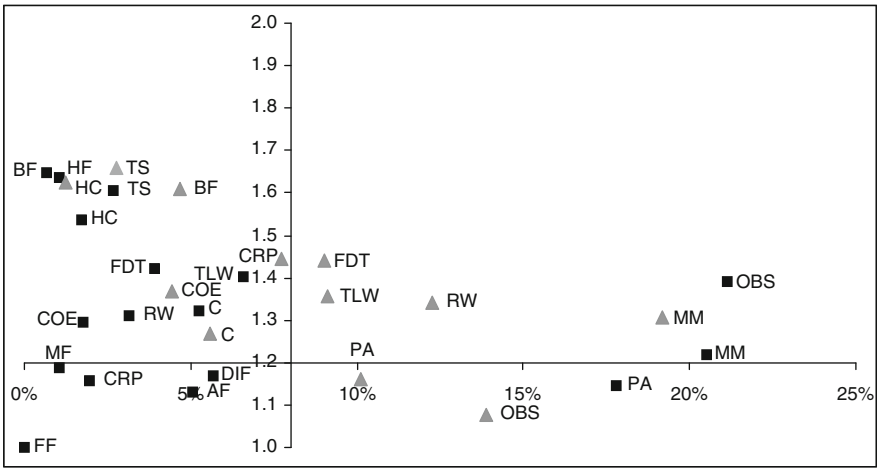

Fig. 5.6 Key sectors for French town and hinterland. *Filled triangle* = Town sectors, Filled square = Hinterland sectors, *X-axis* = multiplier value, *Y-axis* = share of sector output in total output

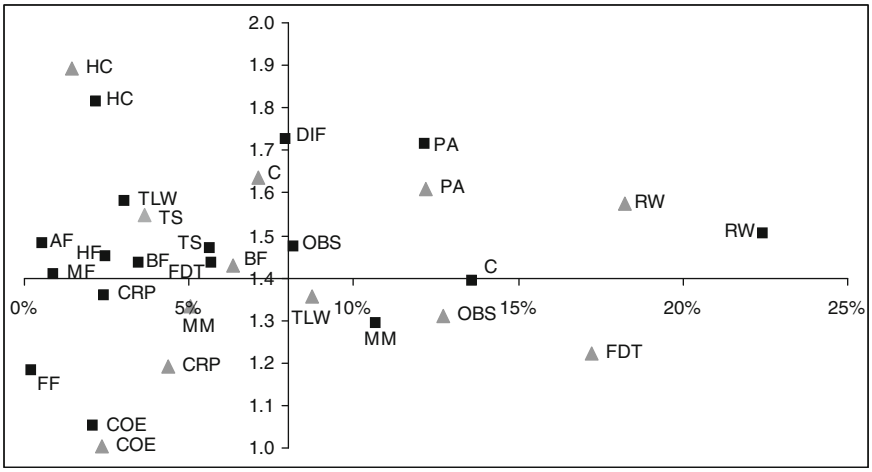

Fig. 5.7 Key sectors for Dutch town and hinterland. *Filled triangle* = Town sectors, Filled square = Hinterland sectors, *X-axis* = multiplier value, *Y-axis* = share of sector output in total output

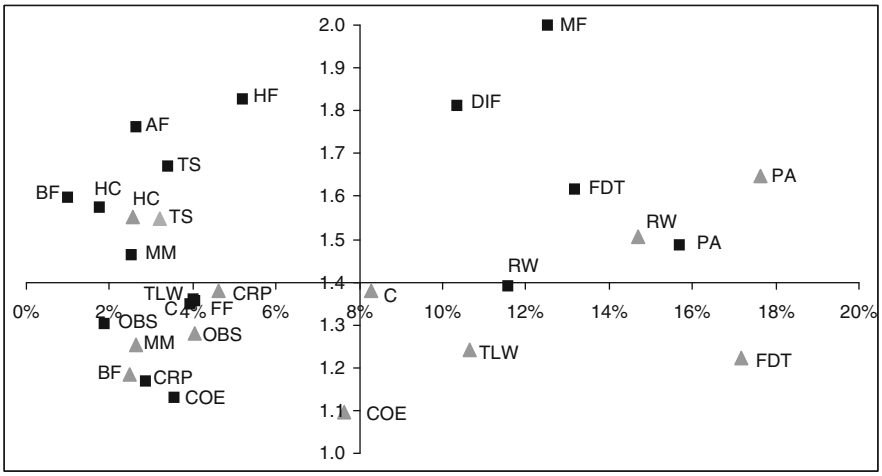

Fig. 5.8 Key sectors for Polish town and hinterland. *Filled triangle* = Town sectors, Filled square = Hinterland sectors, *X-axis* = multiplier value, *Y-axis* = share of sector output in total output

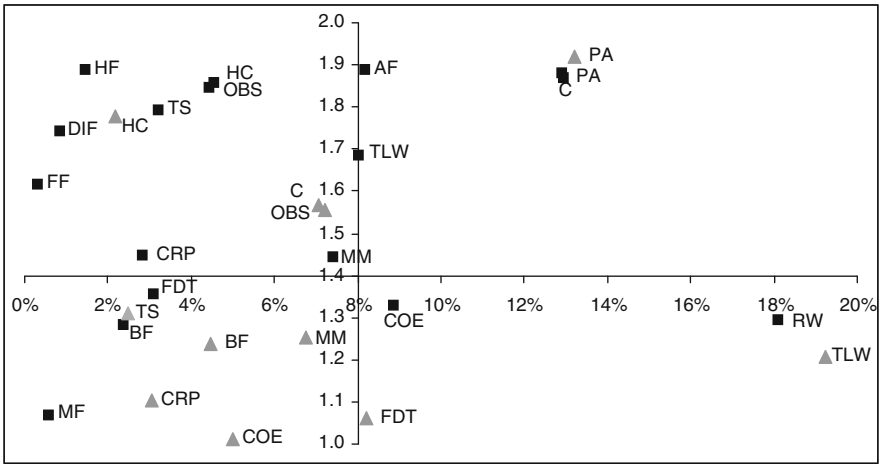

Fig. 5.9 Key sectors for Portuguese town and hinterland. *Filled triangle* = Town sectors, Filled square = Hinterland sectors, *X-axis* = multiplier value, *Y-axis* = share of sector output in total output

Chapter 6
Microsimulation of Rural Households

Abstract Microsimulation (MSM) is a technique that aims at modelling the likely behaviour of individual persons, households, or individual firms. In these models, agents represent members of a population for the purpose of studying how individual (i.e. micro-) behaviour generates aggregate (i.e. macro-) regularities from the bottom-up (e.g. Epstein, Complexity 4: 41–60, 1999). This results in a natural instrument to anticipate trends in the environment by means of monitoring and early warning, as well as to predict and value the short-term and long-term consequences of implementing certain policy measures (Saarloos, A Framework for a Multi-Agent Planning Support System, PhD thesis, Eindhoven University Press Facilities, Eindhoven, 2006). The simulations can be helpful in showing (a bandwidth of) spatial dynamics, especially if linked to geographical information systems. In this chapter, the development of the spatial MSM model SIMtown will be described. This model simulates the total population of Nunspeet and Oudewater,[1] including a large number of household characteristics, several of which are relevant to predict the shopping behaviour. In the second part of the chapter, the simulated micropopulation will be used to show household characteristics which were previously not available and which are useful for local policy makers.

6.1 Introduction

Microsimulation (MSM) is a technique that aims at modelling the likely behaviour of individual persons, households, or individual firms, combining *communicative* qualities with more *analytical* qualities. In simulation modelling, the analyst is interested in information relating to the joint distribution of attributes over a

[1]Nunspeet and Oudewater have been chosen for the microsimulation because they have a relatively clear spatial structure. Furthermore, Nunspeet is an example of a medium-sized town within a predominantly rural area, and Oudewater of a small town in a predominantly urbanized region.

E.S. van Leeuwen, *Urban-Rural Interactions*, Contributions to Economics,
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population (Clarke and Holm 1987). In these models, agents represent members of a population for the purpose of studying how individual (i.e. micro-) behaviour generates aggregate (i.e. macro-) regularities from the bottom-up (e.g. Epstein 1999). This results in a natural instrument to anticipate trends in the environment by means of monitoring and early warning, as well as to predict and value the short-term and long-term consequences of implementing certain policy measures (Saarloos 2006). The simulations can be helpful in showing (a bandwidth of) spatial dynamics, especially if linked to geographical information systems.

Over the last 10 years, the development of spatial microsimulation studies, which add the dimension of space to the behaviour of actors is characterized by an increasing number of application fields. In particular, the publication of large public sample data sets, has allowed researchers to apply spatial microsimulation modelling to various socio-economic subjects. However, the number of studies applying MSM to retail-market analyses is very limited. One of the major obstacles in applying this approach to the evaluation of retail developments is that a large database of consumers and their spatial behaviour is rarely available, particularly at the small-area level (Hanaoka and Clarke 2007). Because our database includes a large number of households, together with information related to their spatial shopping behaviour, MSM will be an excellent tool in exploring consumer behaviour in town and hinterland.

In this chapter, the development of the spatial MSM model SIMtown will be described. This model simulates the total population of Nunspeet and Oudewater,[2] including a large number of household characteristics, several of which are relevant to predict the shopping behaviour. These micro-populations are needed to estimate the effects of different kinds of retail developments in Chap. 7. In the second part of the chapter, the simulated micropopulation will be used to show household characteristics which were previously not available and which are useful for local policy makers.

6.1.1 Short history of MSM

MSM started with the pioneering work of Guy Orcutt and his colleagues around 1960. Within the economics community, he advocated a shift from a traditional focus on sectors of the economy (as Leontief (1951) did with his input-output models) to individual decision-making units. His main aim was to identify and represent individual actors in the economic system and their changing behaviour over time (Clarke and Holm 1987). Orcutt (1957) developed an MSM system because he observed that models at that time were not able to predict the effects

[2]Nunspeet and Oudewater have been chosen for the microsimulation because they have a relatively clear spatial structure. Furthermore, Nunspeet is an example of a medium-sized town within a predominantly rural area, and Oudewater of a small town in a predominantly urbanized region.

of governmental actions. Neither were they able to predict distributions of individuals, households, or firms in single or multivariate classifications, because the models were not built in terms of such units. He argued that, if certain (simple) relationships are linear, it is relatively easy to aggregate them. But, to aggregate relationships about decision-making units into comprehensible relationships between large aggregated units, such as the household sector, is almost impossible. Therefore, his aim was to develop a new type of model of a socio-economic system designed to capitalize on the growing knowledge about decision-making units (DMUs) (Orcutt 1957, p. 117). Most important is the key role played by actual DMUs, such as an individual, household, or firm.

Around the same time, Multi-Agent Systems, also called 'agent-based models' were developed, which have their roots in an interdisciplinary movement and in the field of artificial intelligence (Bousquet and Le Page 2004). The origins of the concept evolved from the Concurrent Actor model of Hewitt (1977). This model proposed the concept of self-contained 'actors' who communicated with other concurrently executing actors by means of messages. Multi-agent systems focus on complex systems where artificial or natural entities interact and produce collective behaviour. This collective behaviour is expressed by the emergence of (global) phenomena, resulting from combinations of local interactions of agents within an environment. Although Orcutt and Hewitt started to develop their new ideas around the same time, the outcome was two different approaches, which until recently did not interact very much.

In the literature, many different terms are used for models that take DMUs into account. According to the International Microsimulation Organisation (2010), we can distinguish three approaches within individual-level modelling which are nowadays moving towards each other.

A first approach is Cellular Automata (CAs), in which all entities are spatially located within a grid of cells. They only have one attribute (alive or dead), and their behaviour is dependent upon the state of the neighbouring cells. CAs have been increasingly used to simulate complex geographical phenomena (Li and Liu 2010). However, these models have their limitations in reflecting individuals' behaviour. Secondly, we can distinguish Agent-Based Models (ABMs). In these models, the emphasis is put on the interaction between individuals, with the main attribute of each individual being their operating characteristics (behavioural rules), which evolve in response to the success or failure of interactions with other individuals. Traditionally, ABMs work with artificial agents. The model is run with non-existing agents, in order to learn more about behavioural processes. The aim is rather to achieve a certain functionality of a kind that might be observed, but also of a kind that might never even be conceived in human systems. In certain simulations, agents have means to communicate, which allow social structures to emerge (Epstein 1999).

The third approach is MicroSimulation Modelling (MSM). Microsimulation is a modelling technique that operates at the level of individual units such as persons, households, vehicles, or firms. Usually, these units do not interact, although in some (dynamic) models individuals can interact, for example by getting married. Within

the model, each unit is represented by a record containing a unique identifier and a set of associated attributes. A set of rules (transition probabilities) is then applied to these units leading to simulated changes in state and behaviour (Clarke 1996).

In this chapter, we will use MSM as a tool to analyse the behaviour of existing households. In essence, there are two major procedures to be carried out in MSM. First of all, the construction of a micro-data set is necessary. This data set should consist of a list with individuals, households or firms, together with their characteristics. Secondly, the micro-data set should be transformed into a micropopulation corresponding to the actual population. When a micropopulation is developed it can be coupled to a behavioural model to simulate certain behaviour (see van Leeuwen et al. 2007).

6.1.2 Examples of Existing MSM

MSM is used to simulate many different situations or events from the perspective of individual behaviour. Until recently, most models were used to study the impacts on social equity of fiscal and demographic changes or to simulate traffic flows over a street network.

Microsimulation models can simulate many different situations or events. Nevertheless, many of them are used to investigate the impacts of fiscal and demographic changes on social equity or to simulate traffic flows over a street network. One of the very first was DYNASIM (later followed by DYNASIM 2). It is a dynamic MSM,[3] developed by, amongst others, Guy Orcutt (Orcutt et al. 1976). A major purpose of DYNASIM was to promote basic research about the impacts of demographic and economic forces on the population of the future. The government of the United States used DYNASIM extensively for analyses of Social Security policy in the late 1970s. Another well-known model is the CORSIM model, which is a direct descendant of DYNASIM. Because the National Institute for Dental Research was a major funding source, considerable effort went into adding characteristics that predicted the dental health of the population. More importantly, its (main) developer Caldwell reprogrammed the model into a different language and ported CORSIM to a PC platform which was much easier to access (Hollenbeck 1995). The design of CORSIM is used by many other model developers.

Another interesting model, which is used by the Australian government is DYNAMOD, which is also a dynamic MSM. DYNAMOD starts in 1986 and ages individuals, month by month, until 2046. It aims to provide empirical illustrations for a range of policy debates. According to their developers, Brown and Harding (2002), MSMs have become very powerful tools in many countries, being used routinely within governments.

[3]A dynamic model takes into account longer-term developments with an explicit consideration of time. The agents do change over the years; they get older, start relationships, or have children, etc.

An interesting example from the Netherlands is NEDYMAS. This is a dynamic MSM which enables the simulation of (future) social security benefits and contributions. It has been developed to 'analyse the life-time redistributive impact of Dutch social security schemes' (Nelissen 1993, p. 225). Along the same lines, Sonsbeek and Gradus (2005), who are affiliated to the Dutch Ministry of Social Affairs and Employment, describe a dynamic MSM that simulates the budgetary impact of the 2006 regime changes in the Dutch disability schemes. The simulation is used to answer questions about individual- or meso-income effects, the exact distribution of expenses amongst different benefits, and the time path of the savings.

Nowadays, increasingly a spatial component is being added to the models, enabling the simulation of developments in different spatial areas, such as regions or zip codes. The development of spatial microsimulation studies during the 1990s and 2000s is characterized by the expansion of application fields. Owing to the publication of large public sample data sets (especially in European countries) and the diffusion of spatial disaggregation methods, spatial microsimulation modelling has been applied to various socio-economic phenomena (Hanaoka and Clarke (2007).

An example is SVERIGE (System for Visualizing Economic and Regional Influences Governing the Environment), which covers the whole of Sweden (Rephann and Holm 2004). It is built on a database comprising longitudinal socio-economic information on all the inhabitants of the country. It is used to study the spatial consequences of public policies at all existing levels. Apart from national models, spatial MSM can also deal with smaller areas. RAMBLAS, for example, aims to predict traffic flows in a transportation network at various times of the day in the Dutch Eindhoven region (Veldhuizen et al. 2000). The developers use activity patterns of households as an important link between land-use and transportation. The specific aim of the microsimulation is to predict which activities will most likely take place where, when, and for how long.

A final example of a (regional) spatial MSM is SimHealth, which focuses on Wales. Smith et al. (2006) describe the framework for an MSM (SimHealth) which identifies the factors that negatively influence people's health; they deal especially with the potential link between areas considered to have poor retail food access and spatial concentrations of diet-related health problems. The model combines spatial information with behavioural and health characteristics by including variables describing residences, employment information, household characteristics, and health characteristics.

Only a small number of the existing (spatial) MSMs focus on rural areas and agriculture. An important example is SMILE, which is a spatial MSM which analyses the impact of policy changes and economic development in rural areas in Ireland. The model simulates fertility, mortality, and migration to provide county-level population and labour force projections, in order to evaluate the spatial impact of changes in society and the economy (Ballas et al. 2005a). Recently, Cullinan et al. (2006) extended the model with environmental information to create indicators of potential agri-tourism hotspots in Ireland in order to explore the potential (total demand for outdoor activities) to diversify from agriculture to agri-tourism.

6.1.3 Distinguishing Different Kinds of MSMs

MSMs can be developed in different ways, the choice between these characteristics relates, on the one hand, to the problem or situation to be analysed, and, on the other hand, to data availability (see also Ballas et al. 2005b). Three ways to classify MSMs are static/dynamic; deterministic/probablistic and spatial/non-spatial.

First of all, models can simulate developments in the short run, without allowing the households to change (for instance, by getting older). This is called a static MSM. The agents do not change, but, for example, their actual behaviour can change or the distribution of benefits over the agents may change. It is often used to answer 'what-if' questions, such as the re-allocation of benefits (e.g. tax benefits) to different household groups due to policy changes. When a model takes into account longer-term developments with an explicit consideration of time, it is called dynamic. In this case, the agents do change over the years; they get older, start relationships, or have children, etc. It is obvious that dynamic models are more complex and, in general, need more data input. Often, different modules are developed, each simulating a particular aspect of the behaviour of the agents. The rules which determine the characteristics of the agents (in both static and dynamic models) can be deterministic or probabilistic. In a deterministic model, the relationships are fully determined by the parameters defined within the model; therefore, in a real deterministic model the patterns of outcomes will always be stable. Often, national data is reweighted to fit small area descriptions. Obviously, the total number of households, or the total number of families with children in a small area should be the same every time. A probabilistic (or stochastic) model incorporates random processes: for example, by using Monte Carlo simulations, either to reflect the random nature of underlying relationships or to account for random influences. Often, a combination of deterministic and probablistic processes is used (Zaidi and Rake 2001).

Furthermore, some of the models are spatially explicit, meaning that the agents are associated with a location in geometric space. They can live, for example, in different zip codes with different characteristics, or, in a mobility model, they can move/travel between distinct areas. Spatial MSM is particularly useful for investigating the geographical inequality of socio-economic policy impacts on households in different locations.

6.1.4 Advantages and Disadvantages of MSM

A first particular advantage of MSM relates to data linkage (coupling). Often, at a low geographical level, the data availability is relatively poor. Provided that there is a link through at least one attribute, then different data sets (for example, questionnaire results and census data at different geographical levels) can be included in the same simulation exercise. This allows the models to be driven by new variables such as household income and expenditure (Ballas et al. 2005b).

Another advantage of MSM is the possibility to incorporate individual behaviour and micro-processes in the model and to use theories of this behaviour (Rephann and Holm 2004). It provides a practical method to implement probabilistic models (such as logit) at the level of the individual. The heterogeneity of the observations (e.g. by questionnaires) can be fully represented and maintained during a simulation experiment. At the same time, the results can easily be aggregated to the level suitable to the question at hand.

A major advantage concerns the ability to address a series of important policy questions. Microsimulation is particularly suitable for systems where the decision-making occurs at the individual unit level, and where the interactions within the system are complex. When the consequences are very different for different groups and thus difficult to predict, MSMs are well suited to estimate and analyse the distributional impacts of policy changes, as they are concerned with the behaviour of micro-units (Mertz 1991). In addition, especially dynamic models can represent indirect effects and the evolutionary pathways of agents (Rephann and Holm 2004). Although, building a dynamic model requires a considerable amount of input and work, it allows relatively robust scenarios or images of the future to be developed.

A technical disadvantage of MSM is the difficulty of validating the outcomes, since it estimates distributions of variables which were previously unknown. One way of validating the results is to re-aggregate estimated data sets to the level at which observed data exist and compare the estimated to the observed distributions.

Another challenge in MSM is that, when simulating the effect of a certain event on the behaviour of households, usually a (behavioural) model is required. Different kinds of models are suitable, but, nevertheless, the results depend on these differences. It is important that the model is robust. However, when it is working, often a wide range of effects can be simulated.

Our aim is to develop a spatially explicit, static MSM using deterministic rules to simulate a rural town-hinterland population in order to show its spatial shopping behaviour. As mentioned before, only a small number of existing models focus on rural areas, and, furthermore, according to Hanaoka and Clarke (2007), their study describes the first spatial microsimulation model applied to retail market analysis. This means that our study is the first to analyse spatial shopping behaviour in rural areas.

6.2 SIMtown MSM Framework

For the development of our MSM model, called SIMtown, we use the static deterministic micro-simulation techniques applied by Ballas et al. (2005a) and enhanced by Smith et al. (2007).

For the simulation we have chosen two different towns: Oudewater and Nunspeet. The population will be simulated at the zip code level (small areas with, in general, a population of between 100 and 4,000 persons). The area of Oudewater and the direct hinterland consists of 18 different zip codes, and the area of Nunspeet

has nine. For a MSM, this number is relatively small. The micro-data set we use is the Marketowns questionnaires database. In total, the database consists of 1,500 completed surveys, around 250 per town.

The deterministic method used to create the synthetic population (micropopulation) is a proportional fitting technique. Using this deterministic reweighting methodology, households from the questionnaires database that best fit chosen demographic characteristics (e.g. kind of household, income level, and place of job) from the Neighbourhood statistics (from Netherlands Statistics) are 'cloned'[4] until the population of each zip code is simulated. The reliability of these synthetic populations can be validated against other census variables to ensure the synthetic population resembles the actual population (Ballas et al. 2006).

The procedure is repeated until each household has been reweighted to reflect the probability of living in each output area. This method ensures that every household has the opportunity to be allocated to every area. However, there may be no 'clones' of a household in an area, or there may be 60 copies of a single household. The criterion is simply how well each household matches the constraints from the Neighbourhood statistics (Smith et al. 2007). Next, in Chap. 7, we will link the static MS model with a behavioural model.

When simulating a micropopulation, one often has a choice between different possible micro-data sets, such as (larger) national micro-data sets with general data or smaller local, more specific ones. To see whether it is essential to use local information instead of general information, we will compare the outcomes of a simulation using the total data set or only the households living in either Oudewater or Nunspeet. In addition, we will also compare the outcomes from simulations with a small and a larger number of constraint variables.

6.2.1 Constraint Variables

Constraint variables are used to fit the micro-data to the real situation/number in the zip code areas. Each of the constraints must be present in both the base survey (micro-data set) and the small-area data set, in our case the Neighbourhood Statistics of 2003 (Statistics Netherlands 2007).

The choice of which variables to use is very important as it affects the outcomes. In some models, the order of constraints in the model, as well as the number of classes distinguished, also has an effect on the results. Unfortunately, there are only a few publications dealing with these subjects (e.g. Smith et al. 2007). Furthermore, the best variables to be used as a constraint are not always available. Particularly, when using small areas, the available data can be limited. In our case, some of the information was only available at the municipality level instead of at zip code level. In these cases we tried to match it, as far as possible, to the smaller areas, as

[4]Households, including all their characteristics, are copied.

described below. We used seven constraint variables in total (that are, of course, also part of the survey) which proved to be relevant according to the multi-nominal logit analysis of spatial shopping behaviour of households described in Chap. 3.

6.2.1.1 Type of Household

The constraint variable 'type of household' refers to the composition of the household. We made a distinction between single households, households with young children (under 18 years), and other households. This information is available at the zip code level, although Statistics Netherlands[5] uses 'households with children' instead of 'households with young children'. We adapted this by using information about the age of the children (available at the municipality level).

6.2.1.2 Income Level

The level of income of the households is measured by means of deciles. We used national decile-groups.[6] Unfortunately, this information is available only for municipalities, not for zip codes. To be able to make a distinction between the different zip codes in the municipality, we used the level of urbanization: we combined information about income levels in each municipality, with the income levels for five levels of urbanization (in general) and the level of urbanization of the zip codes.

6.2.1.3 Car Ownership

We used car ownership as a constraint variable because it is one of the variables of the logit model that explains the spatial shopping behaviour of households (described in Chap. 3). Four classes of households are distinguished: owning no car; owning one car; owning two cars; and owning more than two cars. For each zip code we know the total number of cars. Again, we used the level of urbanization in combination with the four classes.

6.2.1.4 Employment in Zone A, B or C

The place of work is a relevant variable, which also plays a significant role in the logit model. Therefore, it is important to include it as a constraint. It was possible to include three constraints; having a job in zone A, in zone B, and/or in zone C. We started with a file from 2001, describing for each municipality where most

[5]Dutch Bureau of Statistics.

[6]All the Dutch households are sorted according to their level of income. Then, ten equal groups, according to the number of households in each group, are distinguished. The highest income level of each group is used as class boundaries (called 'deciles').

employees have a job. For up to 30 towns, the number of persons working there and living in the municipality concerned (Oudewater or Nunspeet) is given. Because the municipality borders do not correspond with our zones (A, B and C), we used the number of households and the number of jobs available at zip code level to disaggregate the totals. We checked the outcomes with available information about the total number of working persons per zip code and it appeared to be accurate.

6.2.1.5 Agricultural or Non-Agricultural Households

Finally, we used the constraint of number of households living on a farm and the number of households who do not. As location characteristics for farm households can be different from those of non-farm households (e.g. in terms of accessibility or remoteness), it can be helpful to make this distinction. The information on number of farms is available at zip-code level, but only for the year 2004. We used this information, bearing in mind that the actual number might have been slightly higher in 2002. This constraint variable is the only one which is not included in the behavioural logit model.

In addition to the constraint variables, two control variables are used. These variables are not part of the reweighting procedure, but are used to check if the results are reliable.

The control variables are number of persons (instead of households) and the number of single and double-income households.

6.2.2 Validation and Choices

To evaluate the outcomes of the different simulation models, we used the standardized absolute error measure (SAE) as described by Voas and Williamson (2001). The measure sums the discrepancies (TAE = total absolute error) divided by the number of expected households (6.2):

$$TAE = \sum_{k} |T_k - E_k| \tag{6.1}$$

$$SAE = TAE/N \tag{6.2}$$

in which T_k is the observed count of cell k (e.g. zip code 3448), E_k, the expected count for cell k, and N the total expected count for the whole table (e.g. Oudewater as a whole). Of course, it is also necessary to have an error-threshold. Clarke and Madden (2001) use an error threshold of at least 80% of the areas with less than 20% error (SAE < 0.20). Smith et al. (2007) work with a model that simulates persons with diabetes, which is a relatively rare disease, and therefore use an error threshold of less than 10% error (SAE < 0.10) in 90% of the output areas.

Table 6.1 Constraint variables included in the seven different models

Model	Constraints
3C	Joba, Jobb, Household
3CC	Income, Joba, Jobb
4C	Household, Joba, Jobb, Income
5Ccars	Household, Income, Joba, Jobb, Cars
5Cfarm	Household, Income, Joba, Jobb, Farm
6C	Household, Income, Joba, Jobb, Jobc, Cars
7C	Household, Income, Joba, Jobb, Jobc, Cars, Farm

To analyse the effect of the constraint variables on the outcomes, we simulated seven different models (see Table 6.1) with three different household data sets (all, Nunspeet, and Oudewater). The models differ in the selection and number of constraint variables and the data sets used (the total micro-data set or only the part related to the specific town). It is interesting to look at the differences between these models, to learn whether it is better to have more constraint variables, or to see how a larger micro-data set or a more site-specific data set affects the outcomes.

The different outcomes are evaluated with the help of standardized absolute errors (SAE) for income, jobs, kind of household, and the total model: the lower the SAE, the better. In total, we run 28 models as is shown in Table 6.2.

When we compare the differences between the four data sets, it appears first of all that Nunspeet has, in general, lower SAEs compared with Oudewater. This can be explained by the larger number of more heterogeneous zip codes in the Oudewater region. Furthermore, we can see that in almost all cases the use of the total data set results in a better fit compared with the town-specific data sets.

Considering the choice of number and specific constraints, Table 6.2 shows that, in general, the best results are achieved by a model with a larger number of constraint variables. The average SAE values are lowest for the 6C model, and highest for the 3C, and the 3CC model. However, when we look at the scores for the separate constraints, it appears that the 3C model works very well for the 'kind of household' variable and the 3CC model very well for the income variable. This indicates that, in general, more constraints lead to a better model. But, when only a small number of variables are very important, it is better to use a limited number of constraints.

Finally, it appears that not all variables are good constraint variables. In our example, it seems that the variable farm-household disturbs the results of the job variables: both the 5C farm and the 7C model show high errors for these variables, and therefore the 6C model has a better fit than the 7C model. However, this 'disturbance' occurs most strongly in the Oudewater model. In this town, the agricultural sector is more important than it is in Nunspeet. Thus, it seems that different constraint variables could be relevant in different towns.

To summarize, we can conclude from this simulation exercise that, in general, a larger number of (relevant) constraint variables, as well as a larger data set result in the best fit of the simulation model. However, when only a small number of variables are important, it is better to use a limited number of constraints.

Table 6.2 Standardized Absolute Error (SAE) of the constraint variables income, jobs and household for simulation models with different constraints and different data sets

Database	Oudewater		Nunspeet	
	Total	Selection	Total	Selection
Model	SAE		SAE	
Income				
3C	0.50	0.53	0.38	0.42
3CC	0.06	0.14	0.06	0.13
4C	0.10	0.16	0.07	0.13
5Ccars	0.19	0.23	0.16	0.19
5Cfarm	0.10	0.26	0.07	0.14
6C	0.18	0.25	0.16	0.18
7C	0.19	0.34	0.15	0.16
Jobs (A, B, C)				
3C	0.15	0.16	0.05	0.11
3CC	0.15	0.17	0.07	0.11
4C	0.15	0.16	0.06	0.11
5Ccars	0.16	0.16	0.06	0.14
5Cfarm	0.20	0.17	0.11	0.14
6C	0.05	0.04	0.04	0.08
7C	0.12	0.08	0.10	0.12
Kind of Household				
3C	0.11	0.14	0.06	0.10
3CC	0.31	0.33	0.26	0.24
4C	0.18	0.24	0.13	0.14
5Ccars	0.14	0.17	0.11	0.12
5Cfarm	0.15	0.20	0.09	0.13
6C	0.18	0.22	0.10	0.13
7C	0.15	0.20	0.08	0.11
Average[a]				
3C	0.20	0.22	0.15	0.15
3CC	0.18	0.21	0.19	0.14
4C	0.16	0.19	0.09	0.12
5Ccars	0.15	0.16	0.09	0.14
5Cfarm	0.17	0.20	0.10	0.13
6C	0.10	0.12	0.08	0.11
7C	0.13	0.14	0.11	0.12

[a]Average SAE values of the variables: income, job A, job B, job C, kind of household, and car ownership

6.2.3 SIMtown, the Final Framework

The model chosen for the final simulation is the 6C model in which constraints related to household type, income, job in zone A, job in zone B, job in zone C, and car ownership are included. We used these six constraint variables to reweight the total data set (consisting of 1,500 Dutch households).

Unfortunately, the calculated weights are not 100% correct. This is because we only want to work with 'complete' households (not with 0.7 of a household), so that

Table 6.3 SAE values for the constraint variables

Constraints	SAE average		% of areas with SAE < 0.10	
	Oudewater	Nunspeet	Oudewater	Nunspeet
Income (1–10)	0.07	0.08	95	90
Cars (= 0)	0.11	0.04	60	100
Job A	0.01	0.01	100	100
Job B	0.04	0.02	100	100
Job C	0.02	0.01	100	100
Household (1–3)	0.11	0.04	65	90
Total	0.06	0.03	100	100

Table 6.4 SAE values for the control variables number of persons and number of single- and double-income households

		SAE average	% zip codes SAE <0.10	% zip codes SAE <0.20
Oudewater	Persons	0.11	80	90
	Single/double income	0.16	40	100
Nunspeet	Persons	0.04	90	100
	Single/double income	0.19	0	80

the calculated weights (in decimals) need to be rounded to integers, which can cause small number problems. However, after some final improvements, the SAE values indicate that we simulated two usable micro-population data sets (see Table 6.3).

Finally, we also have to look at the results for the control variables. Table 6.4 shows the SAE values for the two control variables, number of persons, and number of single- and double-income households. These variables confirm that the simulation is robust. For Nunspeet, the number of persons is very well simulated. Considering that the number of single- and double-income households is a more complex variable to simulate (because it is related to jobs, and only households with two or more adults are considered) these results are satisfactory as well.

In our opinion, and based on the constraint and control variables of the simulation of households, the new micropopulation of both Oudewater and Nunspeet is a good representation of the actual population.

6.3 SIMtown Micropopulation: A Picture of the Current Situation

An important aspect of MSM is the possibility to aggregate the results to whatever level desired, to provide aggregated data by whatever category or variable needed (Isard et al. 1998). A useful outcome of SIMtown is ‘a picture of the current situation’. The complex reweighting procedure leads to a robust picture of the real (rural) population, as well as of estimations of current flows of purchases.

Of course, the questionnaires also give a nice picture of these flows, although certain groups of households can be under- or overestimated because they were not willing to participate in the survey.

6.3.1 Expenditure Flows of Households

Table 6.5 shows, for each settlement located in the Nunspeet region (see Fig. 6.1), the total share of products bought in the four zones A, B, C, and D. As can be seen on the map, one relatively large and four small towns are located in the hinterland. The larger one is Elburg, with around 11,000 inhabitants. Located just outside the 7 km zone, in zone C is the city of Harderwijk with almost 40,000 inhabitants.

Table 6.5 Share of total purchases bought in the four zones per settlement

Zone Town	A %	B	C	D
Nunspeet	71	6	5	18
Hierden	19	15	38	29
Vierhouten	44	10	12	35
Hulshorst	55	6	13	26
Elburg	11	59	9	20
‘t Harde	17	41	14	28
Doornspijk	30	36	9	25

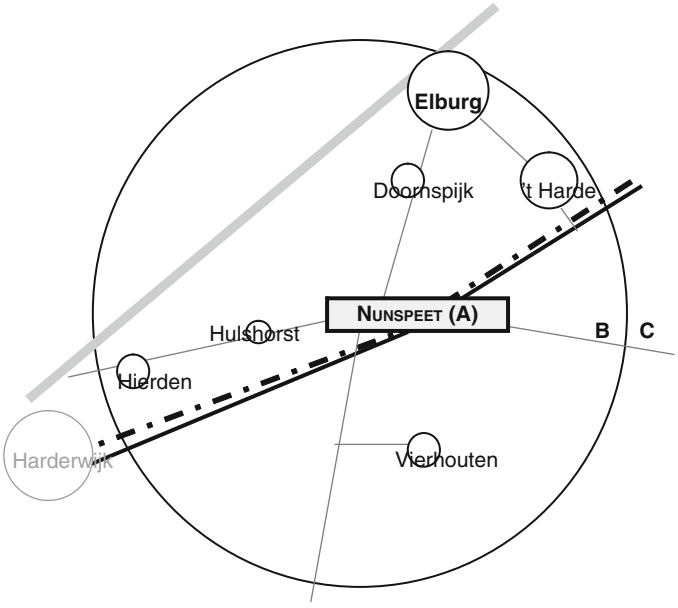

Fig. 6.1 Schematic map of Nunspeet and its hinterland

Not surprisingly, households living in Nunspeet buy most products (71%) in the centre of Nunspeet. However, households from Vierhouten and Hulshorst, two small settlements, also tend to shop in zone A (Nunspeet). Households living in Doornspijk, which is located between Nunspeet and Elburg, spend almost the same share of expenditures in zone A and B. Finally, households living in the larger towns Elburg and 't Harde, relatively far away from Nunspeet, buy more in their own town.

In Oudewater, the situation is slightly different (see Fig. 6.2 and Table 6.6). First of all, Oudewater is much smaller than Nunspeet (10,000 compared with 20,000 persons), but, furthermore, Woerden is (partly) located in Oudewater's hinterland and is a bigger city of almost 50,000 inhabitants. However, there is a barrier between Oudewater and Woerden, in the form of both a highway and a rail track. The other towns in the hinterland of Oudewater are all relatively small, apart from Montfoort which is slightly smaller than Oudewater.

This spatial situation results in lower shares of expenditures in Oudewater, compared with Nunspeet. Only the households living in Oudewater spend around

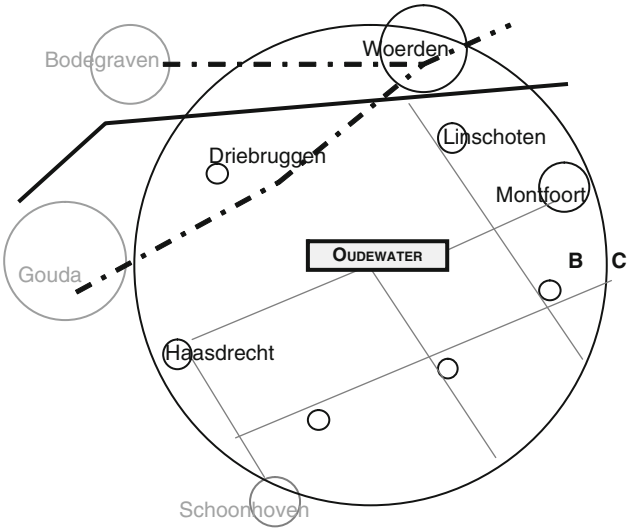

Fig. 6.2 Schematic map of Oudewater and its hinterland

Table 6.6 Share of total purchases bought in the four zones per settlement

Zone Town	A %	B	C	D
Oudewater	58	14	16	13
Woerden	5	76	9	10
Linschoten	10	63	12	16
Montfoort	6	73	10	11
Haasdrecht	9	37	43	11
Driebruggen	16	36	30	18

60% of their expenditures in their own town. Furthermore, households from the smaller towns, such as Haasdrecht, Linschoten and Driebruggen, do around 10% of their shopping in Oudewater. Obviously, the Woerden and Montfoort households spend most money in their own town or in Woerden: around 75% of total expenditures are spent in zone B.

The spatial aggregation of households' shopping behaviour shows very clearly how important local area characteristics are and how strongly they affect their spatial behaviour.

6.3.2 *Spatial Distribution of Households with a Low Income*

In addition, the outcomes of SIMtown also include information about other related subjects. For example, it is possible to get insight into specific household groups which need special social policy attention, information which is often difficult to get on a low geographical level. Figure 6.3 shows the spatial distribution of older households (65 years and older) and Fig. 6.4 the distribution of young households (35 years and younger), both with a relatively low income (income groups 1–3) in and around

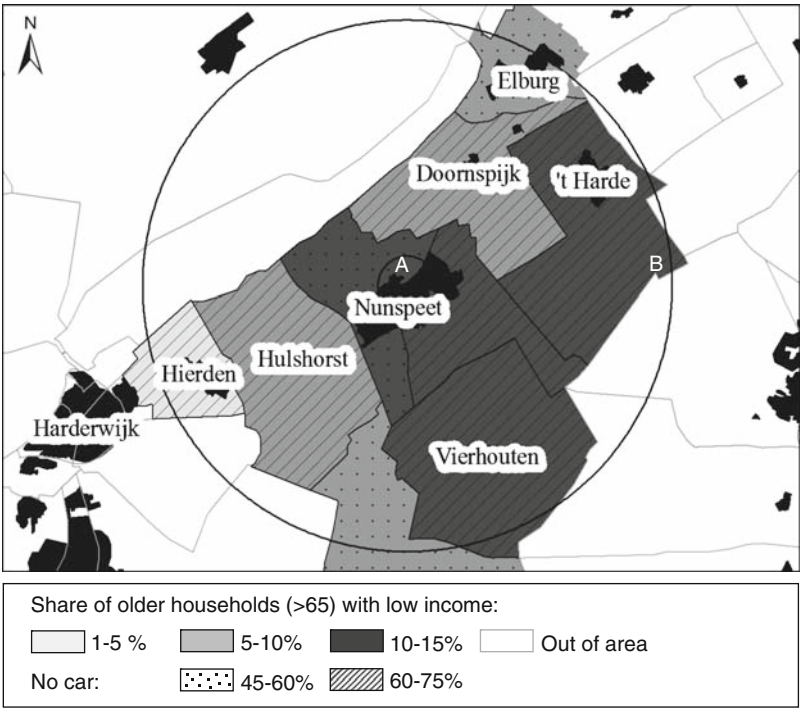

Fig. 6.3 Share in total population of older households (per zip-code) with a low income and the percentage of them without a car in the Nunspeet area

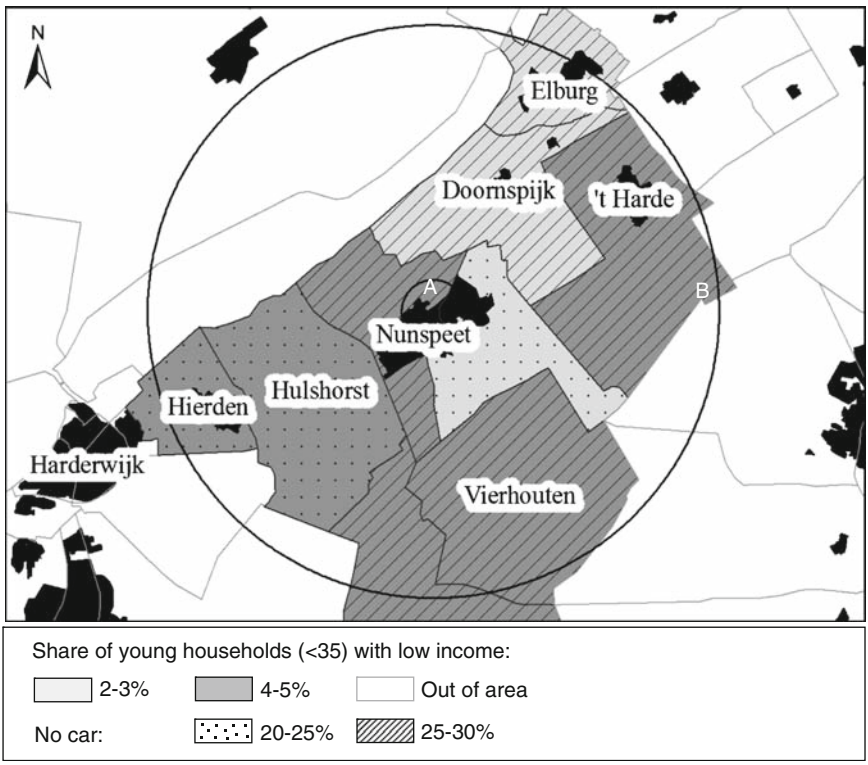

Fig. 6.4 Share in total population of young households (per zip-code) with a low income and the percentage of them without a car in the Nunspeet area

Nunspeet (on the map 'A' indicates the town of Nunspeet and 'B' its hinterland). The dot-patterns show the share of these poorer households without a car.

Figure 6.3 shows that, especially in Nunspeet and Vierhouten, a relatively large share (between 10 and 15%) of the population consists of the elderly with a low income. In the western part of Nunspeet, as many as 60–75% of these households do not own a car. For these households, local facilities are extremely important. In Hierden, only 6% of the households consist of the elderly with a low income, and around half of them owns a car. The share in total population of young households with a low income is much lower, between 2 and 5% (Fig. 6.4). The majority of the households with a head of household younger than 35 have a medium-high income. In addition, most of the young households with low income own a car.

Figures 6.5 and 6.6 show the same distributions of households, but now for the Oudewater area. In Oudewater too, the share of older households with a low income is higher than the share of younger households with a low income (0–15% compared with 0–4%).

In Oudewater, a relatively large share of the population consists of the elderly with a low income, and as many as 75–85% of these households do not own a car.

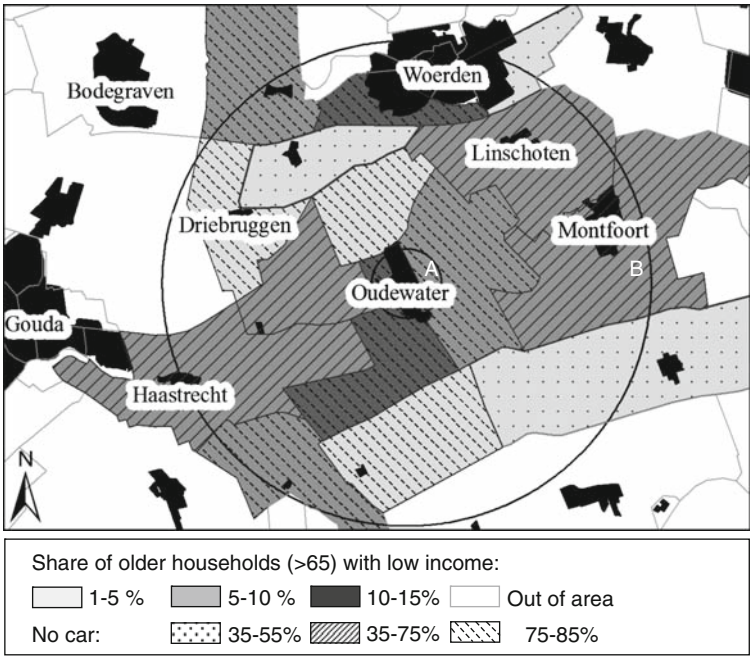

Fig. 6.5 Share in total population of older households (per zip-code) with a low income and the percentage of them without a car in the Oudewater area

These households are really dependent on local facilities, as there is, for example, no train station in Oudewater.

As mentioned earlier, the share of young households with a low income is much lower (see Fig. 6.6). However, in the area of Oudewater a relatively large share of these households do not own a car: for instance, in the area around Driebruggen, only 30% of the young households with a low income own a car. Near Oudewater and Woerden, the share of these households is much lower, and, furthermore, a larger share of them own a car.

6.3.3 Spatial Distribution of Recently Arrived Households

Another interesting topic, which is often difficult to find in spatial databases, is the distribution and characteristics of new households in an area. It shows the attractiveness of an area for certain new residents, as well as the local level of dynamics. The Nunspeet micropopulation includes information about how long a household has lived in the area; this makes it possible to select households who have lived 5 years or less in Nunspeet and its hinterland. Generally, around 10% of the total population recently (less than 5 years ago) moved to the Nunspeet area (see Table 6.7).

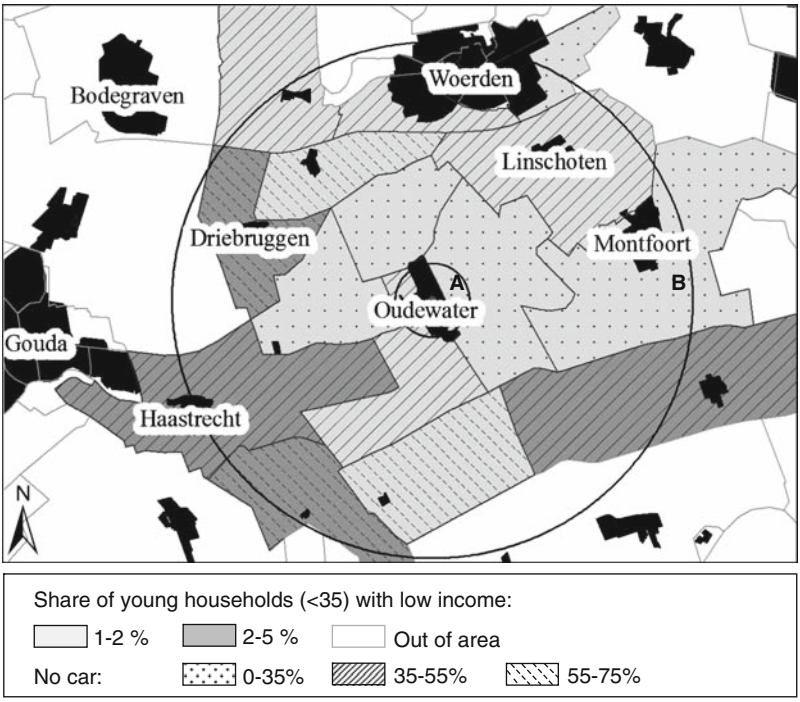

Fig. 6.6 Share in total population of young households (per zip-code) with a low income and the percentage of them without a car in the Oudewater area

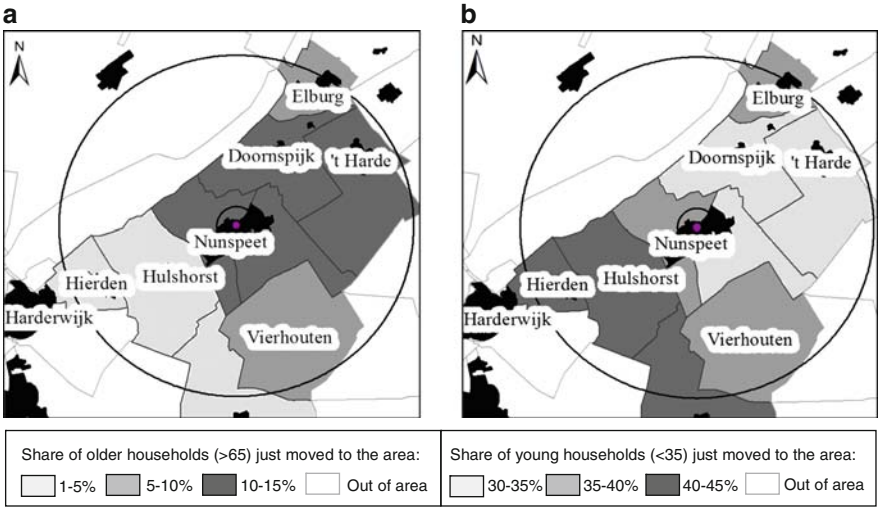

Fig. 6.7 (**a**, **b**): Share in total recently moved (<5 years) households of older households (**a**), same for younger households (**b**)

Table 6.7 Share of households living 5 years or less in the Nunspeet region

Town	Zip code	Total (%)	Living 5 years or shorter in Nunspeet					
			of which old (>65)			of which young (<35)		
			total	High[a] income (%)	Low[b] income (%)	total	High[a] income (%)	Low[b] income (%)
Hierden	3849	11.3	0.5	0	100	4.7	45	11
Nunspeet	8071	8,0	0.9	11	89	2.9	45	7
Nunspeet	8072	7.4	0.8	13	75	2.5	48	12
Vierhouten	8076	9.0	0.6	0	100	3.2	31	19
Hulshorst	8077	7.3	0.0	–	–	2.9	41	7
Elburg	8081	8.6	0.7	14	71	3.1	48	13
't Harde	8084	8.3	1.0	20	70	2.9	55	10
Doornspijk	8085	8.5	0.9	22	67	2.8	39	11

[a]Three highest income deciles
[b]Three lowest income deciles

Figure 6.7a, b shows the spatial distribution of older and younger households who have recently arrived in Nunspeet. Most of them, between 30 and 50%, are young households, and a smaller part, between 1 and 15% are elderly. Interestingly, most older households choose Nunspeet, Doornspijk and 't Harde for their new residence, while younger households are particularly interested in Hierden and Hulshorst. In addition, SIMtown also provides information about several characteristics of the newcomers, such as their income level.

Table 6.7 shows the share of the older and younger households in the total recently moved households with relatively high and relatively low incomes. In line with the former analysis, most older households, which recently moved to the Nunspeet region, have low incomes. However, there is a considerable degree of differentiation: in 't Harde and Doornspijk around a fifth of the new elderly have a high income. Again, many recently moved young households often have a high income. Many of them have double incomes with at least one of the jobs in the region.

6.4 Conclusions

The aim of this chapter was to show the usefulness of spatial MSM in spatial information provision, and to develop a micropopulation suitable for the analysis of spatial shopping behaviour. Therefore, as described in the first part, an MSM model named SIMtown was developed. During the development process, a number of choices had to be made, concerning, for example, the micro-data set (which will be reweighted) and the constraint variables. It appeared that the best micro-data set was the large general data set, rather than the small-local ones. Although the households in the general data set are not specifically related to the town population which was to be simulated, its use resulted in the lowest statistical errors. Furthermore, we decided to use a (relatively) large number of constraint variables: namely,

six. However, not all available constraint variables were included: the variable 'being an agricultural household or not' did not add anything to the model.

In the second part of the chapter, the micropopulation was used for spatial-analyses; three examples of spatial data provision were shown. First of all, the micropopulation was used to give an improved and more spatially disaggregated overview of the shopping locations of households. It showed that households living in Nunspeet buy most products (71%) in the centre of Nunspeet. However, households from small settlements nearby also tend to shop there. In Oudewater, which is relatively small, the situation is different. The households living in Oudewater, spend around 60% of their expenditures in their own town. But households living in nearby smaller settlements only do around 10% of their shopping in Oudewater. This indicates that the regional function of Nunspeet in serving hinterland households is stronger compared with Oudewater. The second and third example of spatial data provision showed the (spatial) distribution of households who need special social policy attention: those with low income and no car, and the spatial distribution of recently arrived households. These insights provide useful inputs for many communicative activities in planning: for example, in debates with stakeholders or in plan presentations.

The information created by MSM is mostly based on complex but well-founded rules. From this chapter we can conclude that, when developing an MSM, the best results come from a MSM framework which uses a large micro-data set and a (relatively) large number of relevant constraint variables. In this way, MSM can be a useful tool in providing specific detailed information about households at a low geographical scale.

Chapter 7
Future Developments in Rural Areas: Combining Micro and Macro

Abstract A great advantage of social accounting matrices (SAM) is their ability to capture a wide variety of processes in a (macro) economy as it links production, factor and income accounts. However, it lacks a certain distributional detail. A major advantage of (spatial) microsimulation (MSM) is the way in which individual behaviour can be simulated, which can be aggregated to show local or regional changes in, for example, household demand. A relatively new approach is to link micro models with macro-economic applications to capture indirect effects of individual behaviour. Our aim is to evaluate future population and future retail developments and the effect on the local economy. Therefore we combine SIMtown with the behavioural MNL model from Chap. 3 to simulate the effect of developments, such as the opening of a new shop or retail centre in town and hinterland. Then, we will estimate the macro effects of these developments, mainly the effects on the retail sector with help of an aggregated retail multiplier. This analysis will show how different locations for retail developments will have different impacts on the local economy.

7.1 Introduction

So far, we have focused on the macroeconomic effects of possible developments (called shocks) using SAM multipliers and microeconomic (shopping) behaviour separately. A great advantage of a SAM is its ability to capture a wide variety of developments in a (macro-) economy, as it links production, factor and income accounts. However, it lacks a certain distributional detail. A major advantage of MSM is the way in which individual behaviour can be simulated. This can be aggregated to show local or regional changes in, for example, household demand. An interesting and relatively new approach is to link micro-models with macro-economic applications to capture the indirect effects of individual behaviour. Until now, this combination has only been rarely described in the scientific literature (Davies 2004). An explanation for this is that both kinds of models need a lot of

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input and time to be developed, so that often these two different models are simply not present at the same time. However, there are some publications, such as Hérault (2005) and Robilliard and Robinson (2005), which describe the linkage between micro- and macro-models, often MSM models and CGE (Computable General Equilibrium) models. These researchers are interested in the distribution of macro-economic effects over individual households. Therefore, they use a top-down approach, in which they first estimate the macroeconomic effect of, for example, tax policy changes, which is then passed on to individual households in the MSM model. Many MSM models deal with (national) tax-benefit reform and income issues, which is why the top-down approach was chosen.

In this chapter, we also combine micro- with macro-results, but instead, we use a bottom-up approach. Our aim is to evaluate future developments and their effect on the local economy. First, we use MSM to simulate the characteristics of future populations. Then, we estimate the macro-effects of these developments, mainly the effects on the retail sector. Apart from simulating future population dynamics, we also simulate the effect of future retail developments, such as the opening of a new shop or retail centre in town and hinterland. This analysis shows how different locations for retail developments would have a different impact on the local economy.

7.2 Bottom-up Approach in Micro-Macro-Modelling

In this chapter, we are interested in the indirect effects of households changing their shopping behaviour and the distribution of effects over different areas. This means that, instead of using a top-down approach as described in the introduction, a bottom-up approach will be most suitable. To date, such an approach has been described by only a few researchers, such as Lattarulo et al. (2002) who apply a MSM/SAM model to the Tuscany region in Italy.

Our main aim is to capture direct and indirect effects of future retail developments in the Nunspeet area, one of the five Dutch case-study towns. These indirect effects are especially interesting because the retail sector obtains most of its input from other sectors; it does not really produce anything itself. To get a complete picture, we will not only simulate the effects of retail developments in 2010 or 2020, but also the changing characteristics of the population of those years (see Fig. 7.1).

Therefore, we first (1 in Fig. 7.1) use SIMtown and demographic prognoses from Statistics Netherlands (CBS) to estimate the micro-effects of future population dynamics on local household expenditures. These micro-effects are used as input for a multiplier analysis to find out what the indirect effects will be.

Secondly (2 in Fig. 7.1), to simulate future retail developments in the best possible way, the future micro-population is used as input for the spatial shopping behaviour model, described in Chap. 3 to estimate the individual effects of new retail developments. Then, the total future expenditures in town and hinterland

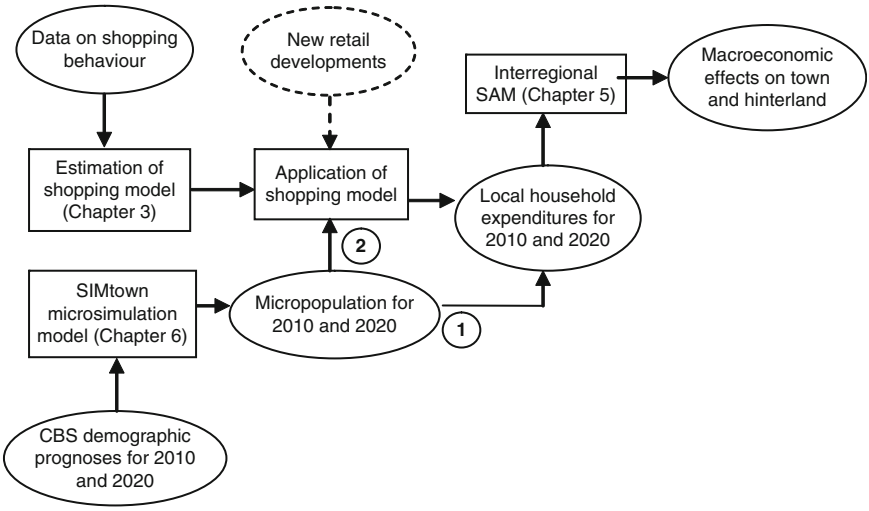

Fig. 7.1 Bottom-up approach linking micro- and macro-models

taking into account specific retail developments are used for the SAM multiplier analysis. The final result is a bandwidth of macroeconomic effects, in town and hinterland, of several future retail developments, differing in size and location.

7.3 Microsimulation as a Tool to Explore the Future

MSM models are often used to show a possible or most likely picture of the future. However, mostly it is dynamic MSM models that are used for this purpose. The decision-making units in these kinds of models change over the years: they get older, die, or they have children. In this way, the composition of the population changes over the course of time. Nevertheless, as these models often do not include specific behavioural modules related to a certain activity, such as shopping, it is only the population that changes, not their behaviour. Besides the strong suitability of these dynamic models in exploring the future, they also have an important drawback: their expensiveness. Because these models are very complex, they require a lot of input. According to Harding (2007) the total development costs of (extensive) dynamic population microsimulation models exceed US$6 million (and more than 10 years of work).

Static models, on the other hand, are less complicated and therefore less expensive. They have the advantage that the simulated first-order effects are very precise (Redmond et al. 1998). However, their primary purpose is traditionally to show the distribution of certain developments, not to simulate a changing population. When static models extrapolate the micropopulation to the (near) future, essentially it

involves the reweighting of a population to reflect exogenously-generated forecasts of particular distributions, such as age and education. For example, if it is assumed that the numbers of young households will increase by 5%, then the sample is reweighted to reflect this (Clarke and Holm 1987). The demographic variables of the individuals, such as age, education, and economic status, do not change. Because of this, static models seem to be reliable for forecasts with a short- or medium-term horizon.

SIMtown is a static deterministic model with a behavioural component. This means that the model does not allow the households to change but that exogenously-generated demographic forecasts (from Statistics Netherlands), which include as much information as possible related to the constraint variables, are used to simulate (reweight) a future population. As has been described, static MSM are especially valuable for short- and medium-term forecasts. This means that the simulation of the 2010 population is most reliable. We will, however, also explore the forecasts for 2020 to be able to better position the results for 2010.

7.4 Micropopulation of 2010 and 2020

7.4.1 Microsimulation of Nunspeet Households

For this exercise, we use the simulated population of Nunspeet for the year 2003, consisting of 17,571 households, together with demographic prognoses from Statistics Netherlands for 2010 and 2020, at municipality level. There are forecasts available on the number of persons and households, as well as kind of households. Because we want to use the same constraint variables (kind of household, income, number of cars, job in zone A, job in zone B and job in zone C) which were used for the simulation of the 2003 micro-population, the future number of jobs (which is not included in the CBS forecasts) is recalculated using the future number of active persons (aged between 15 and 65 years). This means that, in this simulation of the future, employment developments follow demographic developments. Furthermore, it is assumed that, although income will increase between 2003 and 2010/2020, the distribution of households over the ten income classes will remain the same.

To evaluate the outcomes of the simulation of the Nunspeet micro-population of 2010 and 2020, again the standardized absolute error measure (SAE) is used, as described by Voas and Williamson (2001) and explained earlier in Chap. 6.

Table 7.1 shows the SAE values for the six constraint variables. Because the differences between the population in 2003 and in 2010 are not very large (5% increase), the errors are very small (low SAE values). The population growth in 2020 is projected to be 9%, resulting in slightly larger errors. However, both simulated micro-populations are useable.

Table 7.1 SAE values for the constraint variables for Nunspeet in 2010 and 2020

Constraints	SAE average		% of areas with SAE <0.10	
	2010	2020	2010	2020
Income (1–10)	0.01	0.01	100	100
Cars (= 0)	0.01	0.01	100	100
Job A	0.02	0.02	100	100
Job B	0.03	0.03	100	100
Job C	0.02	0.01	100	100
Household (1–3)	0.02	0.02	100	100
Total	0.01	0.02	100	100

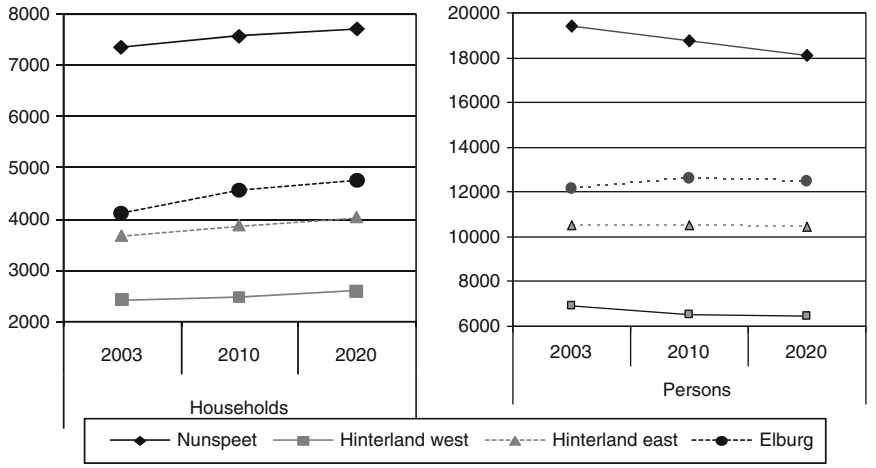

Fig. 7.2 Simulated population dynamics between 2003, 2010 and 2020
Source: SIMtown simulation based on CBS data

7.4.2 Changing Population Characteristics

The information used for the 2003 simulation was mostly zip code-specific data. However, unfortunately the forecasts do not cover such a low level of aggregation. This means that the 2010 and 2020 micro-populations have slightly less spatial heterogeneity. Therefore, some of the zip codes are grouped into new areas so that we now distinguish Nunspeet, hinterland west (Hierden, Hulshorst and Vierhouten), hinterland east (Doornspijk and 't Harde), and Elburg.

Figures 7.2 and 7.3 show the simulated population developments in the Nunspeet region between 2003 and 2020. In line with the national forecast, the number of households is forecast to increase, but the growth in Elburg is expected to be stronger than the growth in Nunspeet. In Elburg, the number of persons also seems to slightly increase, while in Nunspeet this number is likely to decrease by almost 2,000 persons, around 10% of the total population.

Figure 7.3 disaggregates the development of households into young (<40 years) and older households (>60 years). Although, the total number of households in

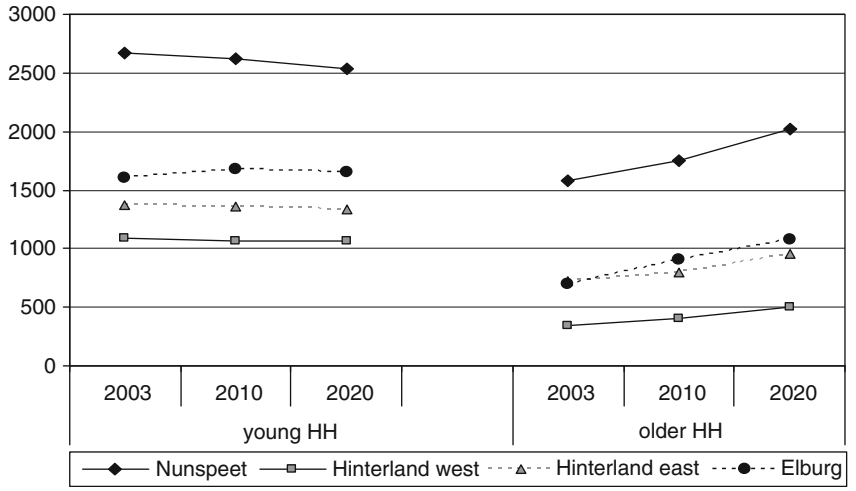

Fig. 7.3 Simulated dynamics in number of young and older households from 2003 to 2020
Source: SIMtown simulation based on CBS data

Nunspeet increases, the number of young households gets smaller and the number of older households increases relatively strongly. In Elburg, the number of older households increases as well (more strongly than in the surrounding hinterland (east)), but here the number of young households increases. This means that the ageing of the population happens less quickly.

For the whole local area, in 2010 the population decreases by 1%, but the number of households increases by 5%. In 2020, the population decreases by 3%, but the number of households increases by almost 9%.

7.4.3 Effect on Shopping Expenses

The simulated growing number of households but decreasing number of persons, as well as the larger share of older households, all affect the total household expenditures in the region. Figure 7.4 shows that, overall, for all products and in all areas, the total amount of expenditures is not expected to change much. The smaller population will spend the same amount of money (when not taking into account income growth over the years); only the distribution over the zones and over the kind of products will change.

First of all, in zone A, the total expenditures are forecast to decrease by around 3% in 2020. However, this decrease is relatively small when taking into consideration that the total population in this zone will decrease by 7%. But, it is surprisingly low when we think about the increasing number of households (by 5%). The most important change in zone A will be the decreasing expenditures on goal shopping. Apparently, the larger group of one-person and older households tend to spend less on these kinds of products.

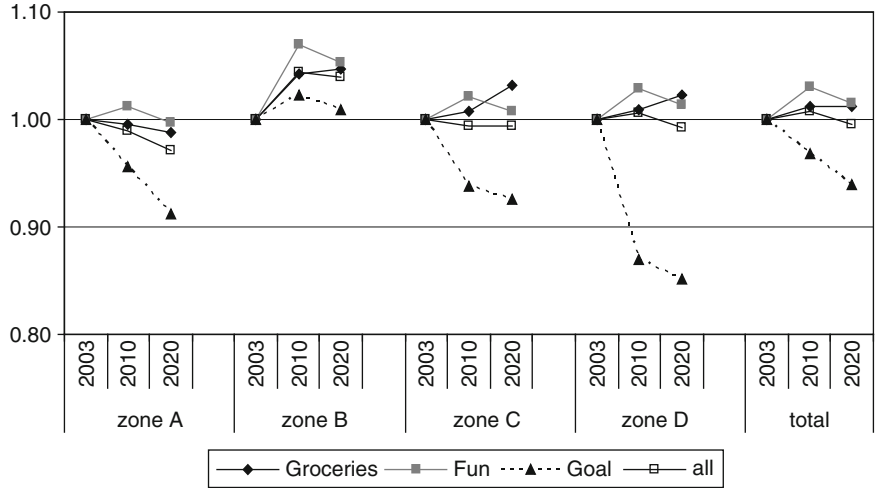

Fig. 7.4 Changing retail expenditures because of population dynamics between 2003 and 2020 (1.0 = level of 2003)

In the hinterland, zone B, the future seems to be brighter: the total expenditures will increase by 4% in 2020. In particular, expenditures on grocery and fun shopping will increase. An important reason for this is the growing number of households in Elburg by around 10%; however, the number of persons will not really change. This shows that the dynamics of the number of persons or number of households cannot predict the changing amount of retail expenditures. Apparently, more detailed indicators are required.

Furthermore, future households from Nunspeet and the direct hinterland are likely to spend a little less in zone C and zone D (ROW). In both zones, there will be a relatively strong decrease in goal shopping, together with an increase in grocery shopping and fun shopping.

To summarize, the simulation of changing expenditures resulting from future population dynamics shows that the total amount of expenditures will not change much between 2003 and 2020. This is an interesting result because, on the one hand, the number of persons will decrease but, on the other, the number of households significantly increases. It appears that future retail expenditures cannot be predicted only by number of persons or number of households.

7.5 Macro-Effects of Population Dynamics

In the former section, it was shown that, between 2003 and 2020, it is likely that in some zones retail demand will decrease, and in others it will increase as a result of future population dynamics. In this next step, not only the direct but also the broader effects of these developments are estimated.

7.5.1 Retail Sector

According to Statistics Netherlands (2003), the trade margin of the Dutch Retail sector is 92%. This means that of all purchases, only 8% goes to the retail sector[1] itself, the rest are payments to other sectors, depending on the kind of products sold. Table 7.2 shows the allocation of consumer expenditures over other sectors. It shows, for example, that most grocery expenditures will flow to the food industry. However, it does not show in which zone the purchased products are produced. Of course, we can not assume that they were all produced locally, in zone A or B.

From the firm questionnaires, which include 37 shops in Nunspeet and 215 in the other five towns, it appears that, in general, between 5 and 8% of the input of the retail sector is obtained in zones A and B, including services like financial services.

7.5.2 SAM Retail Multiplier

The multipliers resulting from the Nunspeet SAM show the redistributive effect of extra demand which will be allocated to the town and the hinterland. It is not only the information about the allocation of effects over the different zones that make the SAM multiplier an interesting tool. In addition, the insight in the distribution over other sectors, wage-payments and local income is also very useful.

However, because the retail sector itself receives only 8% of the total household expenditures, the redistributive effects of the sectors to which the shopping expenditures are allocated have to be taken into account as well. Table 7.3 shows the aggregated (and reweighted) multipliers for grocery, fun and goal shopping in zones A and B.

It appears that the multipliers differ for the different kinds of shopping; in particular the multipliers for goal shopping are on average lower. This is, first of

Table 7.2 Allocation of shopping expenditures

	Groceries	Fun	Goal
Agriculture	0.10	0.03	0.03
Food, drink and tobacco	0.82	0.00	0.03
Textiles leather, wood and furniture	0.00	0.52	0.21
Chemicals, rubber, plastics and glass	0.00	0.22	0.15
Metals, machinery, electrical, computing and transport equipments	0.00	0.15	0.45
Retail sector	0.08	0.08	0.08
Public administration, education, health and other services	0.00	0.00	0.05
Total	1.00	1.00	1.00

Source: Mayfield et al. (2005)

[1]We assume that this trade-margin is equal for the three categories of shopping, but in reality there will be differences.

Table 7.3 Redistributive effect of extra demand for grocery, fun and goal products in zones A and B (SAM output multipliers)

	Groceries		Fun		Goal	
	Zone A	Zone B	Zone A	Zone B	Zone A	Zone B
Town						
Output[a]	1.14[b]	0.33	1.08[b]	0.13	1.03[b]	0.09
Factor[c]	0.08	0.03	0.17	0.02	0.10	0.02
Income	0.03	0.02	0.06	0.02	0.04	0.02
Hinterland						
Output	0.08	1.04[b]	0.04	1.05[b]	0.02	1.00[b]
Factor	0.04	0.11	0.10	0.13	0.05	0.09
Income	0.02	0.04	0.06	0.04	0.03	0.03
Total	1.39	1.56	1.50	1.39	1.27	1.25

[a]Including interregional 'loop' effects
[b]Including shock (of 1 €)
[c]Payments in the form of wages, rent and subsidies

Table 7.4 Macroeconomic (ME) effects (* €1000) per month in town and hinterland from changing demand in 2010

Impact on:	Town				Hinterland				Total ME effect
2010	Output	Factor	HH income	Sub-total	Output	Factor	HH income	Sub-total	
Town	−67	−5	−2	−73	−2	−2	−1	−5	−78
Hinterland	33	3	3	39	148	16	6	170	209
Total	−34	−1	1	−34	146	14	4	164	130

Table 7.5 Macroeconomic (ME) effects (* €1000) per month in town and hinterland from changing demand in 2020

Impact on:	Town				Hinterland				Total ME effect
2020	Output	Factor	HH income	Sub-total	Output	Factor	HH income	Sub-total	
Town	−180	−16	−6	−201	−6	−8	−5	−18	−219
Hinterland	33	3	2	38	126	14	5	145	184
Total	−147	−13	−3	−163	120	6	0	127	−36

all, because there are only a few firms in metals, machinery, electrical, computing and transport equipments located in the Nunspeet area. Furthermore, the redistributive effects on labour and income are slightly lower than in the sectors involved in producing for example fun shopping products.

The outcomes for the year 2010 are shown in Table 7.4 and for the year 2020 in Table 7.5. It appears that, in Nunspeet, the decreasing demand in town of around −€64 thousand in 2010 will result in an economic loss of −€73 thousand for zone A and −€5 thousand for zone B, a total of −€78 thousand a month, or more than €−1 million a year. However, in the same year, the expenditures in zone B will increase, which also has a positive effect on zone A of €39 thousand (because of the

interregional linkages of in particular groceries). The total macroeconomic gain of the €171 thousand extra demand will be €209 thousand a month: €2.7 million a year. The total developments in town and hinterland lead to a positive local effect (in town + hinterland), with a value of €1.3 million a year. In addition, the household income in town would even increase a little bit.

In 2020 the results seem to be (even) less positive: the loss of expenditures in town will get larger and the gain in the hinterland smaller. This means that the local effect of the population dynamics will be negative, a loss of −€36 thousand a month or −€0.5 million a year. However, this local loss is small compared with the losses of the Nunspeet town retailers. Here, there will be a macroeconomic loss of −€2 million per year.

The loss of (net) income in town will be almost −€3 thousand per month. In the Netherlands, modal income[2] is around €2,500 a month per household. This means that because of the changing demand in 2020, the income of only one households living in town will be lost. In the hinterland, however, there will be no effect on the household income.

This analysis has shown that population developments in 2010 and 2020, and the related decrease in town retail expenditures and increase in hinterland retail expenditures, will first likely result in a positive local (macroeconomic) effect in 2010 of €1.3 million a year, but, in 2020 there will be a negative local effect of −€0.5 million a year. However, the biggest challenges will arise in Nunspeet, where in 2020 the total (macro) economic loss will be more than −€2 million. Most of this loss will be redistributed to other sectors (output) and only 10% to households in the form of less wage-payments and income.

7.6 Simulation of Future Shopping Developments

7.6.1 Shopping Developments and MSM

Until recently, the development of out-of-town retail centres was not permitted in the Netherlands. Nowadays, the national government has handed over the responsibility to the local authorities, so they can decide whether out-of-town retail centres are permitted in their area. Obviously, this decision is not easily made. For local policy makers, it is difficult to assess all possible spatial and socio-economic developments and to finally make a decision (see also van Leeuwen et al. 2007).

In Britain, the development of out-of-town retail centres is much more common. However, there are only a limited number of detailed studies of the impact of the newer out-of-centre facilities on the smaller traditional centres (Thomas and Bromley 2003). An example is the study of Collis et al. (2000), who show that a

[2]Modal income is defined as the gross income of a family consisting of two partners with one job and two children.

small market town (Atherstone) was experiencing considerable difficulty in offsetting the competitive effects of superstores in the larger nearby centres. Despite a potential local trade area with a population of around 12,500 and 160 existing retail and service outlets, the study indicates a decline from 89% to 23% for households using the town centre as their regular grocery shopping venue. In addition, a report written for the British government indicates the difficulties imposed upon small market towns by the increasing development of smaller superstores (with a floor space of 2,325–2,790 m^2) in their vicinities (Department of the Environment, Transport and the Regions 1998). From this study it became clear that food stores in the traditional centres would experience losses of between 13% and 50% of their former trade. This had the most significant adverse effects on the smaller centres with populations of between 6,000 and 10,000.

The centre of Nunspeet has a relatively large number of shops (compared with the centres nearby). This is explained by a significant group of tourists, as well as by the centralization of the facilities in the centre itself. For example, almost all supermarkets are located in the centre. In addition, there is a weekly market, which is highly appreciated and frequently visited by local and regional customers. This is also important for the Nunspeet retail sector, because 73% of the market visitors combine a visit to the market with shopping activities in the centre (I&O Research 2004[3]). Because, until now, most shops have been concentrated in the shopping centre, the retailers are not keen on the development of out-of-town retailing.

Apart from giving insight into the current situation, MSM is especially useful for showing the effects of future developments. We can use the individual household data from the micro-population as input for the logit model in order to convert the probabilities resulting from the behavioural model into monthly expenditures per household and per zone. Moreover, these data can be used to obtain a better insight into the effect of certain planned developments on specific groups of households. If, for example, new retail centres were developed, this would have a different impact on different groups of households. This would make it possible to make a relatively exact estimation of the effects. Furthermore, the micro-population (of 2003 and 2010) enables us to disaggregate group results to show specific impacts on population subgroups.

7.6.2 Building a New Supermarket

In Nunspeet, the municipality is considering allowing a large supermarket to build a new store in the centre of the town in 2009. The total new shopping surface would be 1,240 m^2, a considerable amount compared with the existing 7,000 m^2. With the help of the MNL model and the micro-population 2010 data set, we can simulate the

[3]I&O Research (2004). *Markt in zicht! Landelijk marktonderzoek 2004*. I&O Research, Enschede.

Table 7.6 The effects of a new supermarket on the total grocery expenditures in the four zones (in monthly expenditures per zone)

Zone	Monthly expenditures per zone (€)				Local effect (€)
	A	B	C	D	A+B
Initial monthly expenditures[a]	3,115,715	1,959,871	471,180	58,046	
Store in Nunspeet	96,404	−67,879	−24,949	−3,576	28,525
Store in hinterland (Elburg)	−72,734	96,925	−20,493	−3,697	24,190
Store in hinterland ('t Harde)	−57,817	93,112	−29,737	−5,558	35,295
Store in zone C (Harderwijk)	−20,862	−6,560	28,224	−801	−27,423

[a]Of all households in town and hinterland in 2010 on grocery products

effect of this new supermarket. In addition, we can also simulate three alternatives: what if (1) the supermarket were to be built elsewhere in a large town in the hinterland (Elburg); (2) in a small town in the hinterland ('t Harde); or (3) in a small city in zone C (Harderwijk at 10 km distance). We measure the effect in 'changing expenditures per zone per month'; the last column in Table 7.6 shows the results for the local area.

It appears that, if the new supermarket were to be built in Nunspeet, the monthly expenditures on groceries there would increase by €96,000 (3.1%) at the cost of expenditures in the other zones. If the store were to be built in a slightly smaller town in the hinterland (Elburg), the expenditures there would increase by €97,000 (5.1%), leading to a significant loss in Nunspeet. Obviously, for Nunspeet the best option is to build the store in Nunspeet itself. However, for the subregion Nunspeet-Elburg, it would be best to build the supermarket in 't Harde.

7.6.3 Building a New Retail Centre

The Netherlands Institute of Spatial Planning (RPB), in their study 'Winkelen in Megaland' [shopping in Megaland] (Evers et al. 2005) about retail centres in the future, described six scenarios of future retail development. First of all, following expert opinions, total floor space will increase by 12% until 2010.[4] The distribution of floor space over different types of shops (grocery, fun, or goal) depends on the kind of development. For now, we will focus on two scenarios: Scenario 1 the development of a retail centre *in* the centre of Nunspeet, Elburg (medium town in hinterland), or 't Harde (small town in hinterland), or to have two separate centres, one in Nunspeet and one in Elburg. Scenario 2 is the development of a retail centre just *outside* Nunspeet or Elburg along an arterial road. For the simulations, the micro-population of 2010 is used.

[4]This leads to an increased floor space of 4,600 m in zone A and 3,300 m in zone B.

7.6.3.1 Scenario 1: New Retail Centre in Town

Scenario 1 deals with the development of a new retail centre in a town centre, usually near the location where most of the existing shops are. These kinds of centres would consist of 80% fun and 20% goal shopping.

Table 7.7 shows that, contrary to the development of a new supermarket in Nunspeet, the development of a whole retail centre would result in a larger local effect compared with building it in the centre of Elburg. The extra local monthly expenditures would be 15% higher in Nunspeet compared with Elburg, mostly as a result of lower expenditures in zone C and D. The explanation for this is that Nunspeet already has a larger supply of fun-shopping and thus a stronger regional function. Adding more shops would make such a centre more interesting for this kind of shopping. But, as the extra floor space in zone B would be less than in zone A, the revenue per additional square metre in zone B would be higher: €25 per m compared with €22 per m per month.

Interestingly, building a retail centre in 't Harde instead of Elburg would result in a higher local effect because of less expenditures in zones C and D. 't Harde has a population of around 6,000 households not including tourists and soldiers encamped there. If the retail centre is built in 't Harde, these people, as well as people from surrounding areas, would be less tempted to shop in zone C or D. Overall, for the Nunspeet-Elburg region, it would be best to have a new retail centre both in Nunspeet and in Elburg.

7.6.3.2 Scenario 2: New Retail Centre Outside a Town

Scenario 2 deals with the development of a retail centre just *outside* a town, along an arterial road (see Table 7.8). Such a centre would consist of 10% grocery, 60% fun, and 30% goal shopping. Because this centre would not be developed in the existing towns it is not possible to use the same behavioural model that we used until now: it needs an extra zone. Therefore, we extended the model with a 'new

Table 7.7 Changing flow of total expenditures (grocery, fun, and goal shopping) for Scenario 1 for different possible locations

Scenario 1	Monthly expenditures per zone (€)				Local effect (€)
Zone	A	B	C	D	A+B
Initial monthly expenditures[a]	6,369,958	4,048,063	1,335,940	1,917,850	10,418,021
Centre in Nunspeet	100,224	−29,338	−18,433	−52,453	70,885
Centre in Elburg	−31,752	83,298	−13,382	−38,164	51,546
Centre in 't Harde	−19,849	76,800	−15,632	−41,319	56,951
Centre in Nunspeet and Elburg	67,723	52,499	−31,253	−88,969	120,222

[a]Of all households in town and hinterland in 2010

Table 7.8 Changing flow of total expenditures (grocery, fun and goal shopping) for Scenario 2

Scenario 2	Monthly expenditures per zone (€)					Local effect (€)
Zone	A	New centre	B	C	D	A+B
Initial monthly expenditures[a]	6,330,693	0	4,066,760	1,344,598	1,929,761	10,397,453
New centre just outside Nunspeet	−687,993	1,586,464	−434,647	−149,364	−314,461	463,825
New centre just outside Elburg	−210,218	797,669	−347,217	−76,161	−164,073	240,234

[a]Of all households in town and hinterland

centre' zone (Nc) with a specific amount of floor space (in total 4,600 m extra) and distance to the existing towns depending on the location (near Nunspeet or near Elburg), as follows (extension printed in bold):

$$\begin{aligned} U_i(A) = {} & \alpha \ln dist_{iA} + \beta \ln floor_{iA} + \gamma job_{iA} + \delta(\ln dist_{iA} * car_i) \\ & + \theta(age_i * \ln dist_{iA}) + \iota \ln year_i + \varepsilon_{iA} \end{aligned}$$

$$\begin{aligned} \mathbf{U_i(Nc)} = {} & \alpha \mathbf{\ln dist_{iNc}} + \beta \mathbf{\ln floor_{iNc}} + \gamma \mathbf{job_{iA/B}} + \delta(\mathbf{\ln dist_{iNc} * car_i}) \\ & + \theta(\mathbf{age_i * \ln dist_{iNc}}) + \iota \mathbf{\ln year_i} + \varepsilon_{\mathbf{iA}} \end{aligned}$$

$$\begin{aligned} U_i(B) = {} & \alpha \ln dist_{iB} + \beta \ln floor_{iB} + \gamma job_{iB} + \delta(\ln dis_{iB} * car_i) \\ & + \theta(age_i * \ln dist_{iB}) + \iota \ln year_i + \varepsilon_{iB} \end{aligned}$$

$$\begin{aligned} U_i(C) = {} & \alpha \ln dist_{iC} + \beta \ln floor_{iC} + \gamma job_{iC} + \delta(\ln dist_{iC} * car_i) \\ & + \theta(age_i * \ln dist_{iC}) + \iota(0) + \varepsilon_{iC} \end{aligned}$$

$$\begin{aligned} U_i(D) = {} & \gamma job_{iD} + \zeta income_i + \eta kids_i + \kappa Oudewater_i + \lambda Gemert_i \\ & + \nu Nunspeet_i + \xi Schagen_i + o Bolsward_i + \varepsilon_{iD} \end{aligned}$$

This multinomial model allows this extension because, as explained in Chap. 3, general parameters for distance and floor space are used.[5]

Table 7.8 shows the result of the simulation. Apparently, these kinds of developments can have major impacts on the shops in local city centres. If the centre were to be built near Nunspeet (we chose a fictitious location along the Elburgerweg, north-east of Nunspeet), the loss in zone A, Nunspeet, would be

[5]For the utility function of the new shopping centre it is not possible to use 'job in the new centre', so we used 'job in A', if the centre were to be developed near Nunspeet, and 'job in B' if it were to be developed near Elburg.

more than 10% of the total expenditures in 2010, and the same holds for zone B. The expenditures in the new centre would be quite significant, around €1.6 million a month; almost the same amount as would be spent in the rest of the Netherlands.

If the centre were to be built near Elburg (we chose a fictitious location along the Gerichtenweg, south of Elburg), the effects would be smaller, although the floor space of the retail centre is the same. The total monthly expenditures in the new centre near Elburg would be around half of the amount spent if it were to be developed near Nunspeet. The explanation for this is that, if the centre were to be developed near Nunspeet, it would have a more central location. Both for households in Nunspeet, and for those living between Nunspeet and Elburg, this location is far more attractive: they would spend around four times more euros in the new centre. Only households living in Elburg would spend more money in the new centre if it were to be developed near their own town. Although the new centre would consist for only 10% of grocery shops, around 20% of the total expenditures would be on this kind of products when the centre were to be built near Nunspeet. In addition, 24% of the loss that would appear in zone A is in grocery expenditures. When the centre were to be built in zone B, the expenditures on the three product groups are more in line with the shares of floor space for each kind of shop. Apparently, a new centre near Nunspeet would be extra attractive for grocery shopping.

Figure 7.5 shows these significant differences. It also shows that total local expenditures would increase more if the new centre were to be built near Nunspeet, especially because of lower expenditures in zone D, the rest of the world.

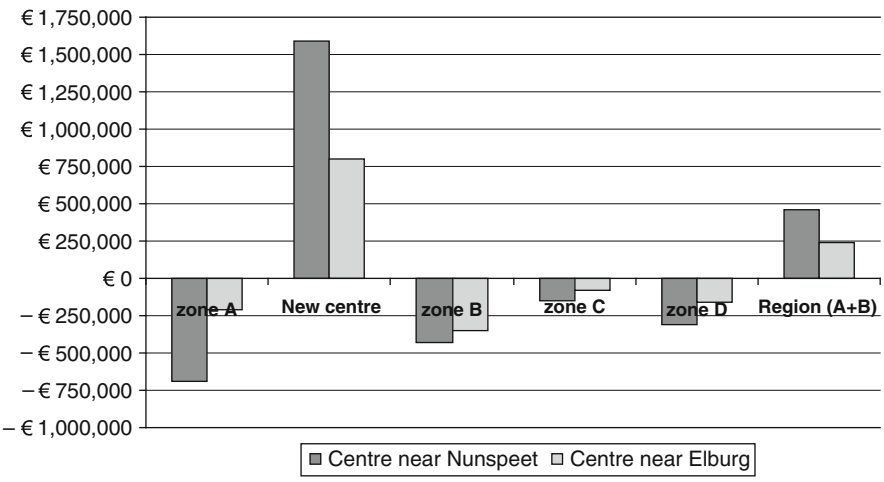

Fig. 7.5 Changing flow of monthly expenditures per zone if a new retail centre were to be built either near Nunspeet or near Elburg

7.6.4 Micro-Results: Which Households Will Change Their Behaviour?

Table 7.8 showed the effect of a new retail centre, either near Nunspeet or near Elburg. The effects seemed to be rather significant: more than 10% loss of total expenditures in zone A and B if the centre were to be built near Nunspeet. But what kind of households are causing this loss and choose to shop in the new centre?

SIMtown allows us to take a closer look at the results and to see which kind of households are most likely to change their shopping behaviour, that is, to buy less in zone A and more in the new retail centre just outside Nunspeet.

First of all, from the behavioural model (described in Chap. 3) it appears that for grocery shopping the distance to an area, as well as the available floor space is very important. For goal-shopping, the available floor space in an area is (relatively) less decisive for the shopping location choice. Instead, the (short) distance to an area, as well as having a job there and owning a car positively contributes to the attractiveness of an area for goal shopping. Furthermore, families with children are, in general, less attracted to stores in the local area for their goal shopping. For fun shopping, the distance is less important, as is owning a car. Instead, the available floor space attracts customers.

From the micro-results it appears that particularly households from Nunspeet itself would tend to spend to less on fun and goal shopping in zone A and more in the new centre. From the northern part of Nunspeet, it is especially households with an average age of 40, with children, a low income, some without a car and some with a job in A or B, who would do a relatively large share of their fun shopping in the new centre. At the same time, it is particularly older households (average age of 60), with a medium income, a job in A, and a car who would be more likely to go to the new centre for goal shopping. From the southern part of Nunspeet, further away from the new shopping centre, a different group of households are more likely to change their location of fun shopping. From this area, it is, again, households with a low income, but they do not have a job in A or B, their age is very diverse, and they own a car. The households that will go goal shopping in the new centre are similar to the households from the northern part of Nunspeet: medium income, medium age, and owning a car. Most probably, these households would visit the centre by car, which means that sufficient parking spaces should be provided.

Households living in Elburg are also tempted to go to the new centre near Nunspeet. Particularly young households (average age of 32), with low income, not always with a car, and sometimes having a job in A or B are more likely to go fun-shopping over there. If the shops from the new retail centre do want to attract these kinds of households as customers, it is important that a public transport line should also be developed between Elburg and the centre.

7.7 Macro-effects of New Retail Developments

By using the aggregated SAM retail multipliers for the three kinds of shopping, it is possible to estimate the macroeconomic effects of the new shopping centres. Besides the direct effects of households changing their shopping location, it also reveals the effects to other sectors, as well as the redistributive effects of (extra) household income and related extra expenditures.

Table 7.9 shows the total effects (* €1000) for five different situations; three related to Scenario 1 and two related to Scenario 2. What is most striking is the large difference between developing a new retail centre in an existing shopping area (Scenario 1), compared with developing a new centre outside the towns. Even if a new centre were to be developed in both Nunspeet and Elburg, the total direct and macroeconomic effects would be much smaller (even as much as four times) compared with the developments of a new centre just outside Nunspeet (with in total less floor space).

Furthermore, it is interesting to see that the difference in macro-effect on the local area between building a new centre in Nunspeet or in Elburg is not very

Table 7.9 Macroeconomic (ME) effects (* €1000) per month in town and hinterland from retail developments in 2010

	Town				Hinterland				Total ME effect
	Output	Factor	HH income	Sub-total	Output	Factor	HH income	Sub-total	
Scenario 1									
In Nunspeet									
Town	88	12	4	104	3	6	4	13	117
Hinterland	−3	0	0	−3	−23	−3	−1	−26	−31
Total	86	11	4	101	−20	4	3	−13	86
In Elburg									
Town	−28	−4	−1	−33	−1	−2	−1	−4	−37
Hinterland	8	2	1	11	74	8	3	85	96
Total	−20	−2	0	−22	73	6	2	81	59
In Nunspeet and Elburg									
Town	38	6	2	46	1	3	2	7	53
Hinterland	4	1	1	5	30	4	1	35	39
Total	42	6	3	51	31	7	3	92	92
Scenario 2									
Near Nunspeet									
Town	−344	−55	−19	−418	−15	−26	−16	−57	−475
Hinterland	93	17	14	124	592	93	31	716	840
Total	−251	−38	−5	−294	577	67	15	659	365
Near Elburg									
Town	−102	−17	−6	−125	−4	−8	−5	−17	−143
Hinterland	32	7	6	44	229	37	12	278	322
Total	−70	−11	−1	−81	225	28	7	261	180

significant. The loss for the zone without the new centre is also relatively small: around −€37 thousand a month, −€487 thousand a year. However, the difference between building a new shopping centre near Nunspeet or near Elburg is considerable. The total economic effects for the local area would be twice as much if the centre were to be built near Nunspeet. On the other hand, the negative effects, particularly on Nunspeet itself, would also differ considerably.

From this analysis, it appears that building extra shops in the future, in existing shopping areas, such as the centre of Nunspeet or Elburg, would result in some (minor) changes in the shopping behaviour of households. However, developing an entire new retail centre outside a medium-sized town, such as Nunspeet (Scenario 2), would result in a much more significant change. The macroeconomic effects would sum up to a local gain of €4.7 million a year. But the loss for the local Nunspeet economy would be −€6.2 million a year. The reason for this is that these latter out-of-town developments create (totally) new opportunities for the households, by changing the distance, and therefore the travel costs (in time or money), to convenient shopping areas. Interestingly, the loss in Nunspeet will be mainly a loss of output and factor payments, but local household income in Nunspeet will actually increase slightly.

7.8 Conclusions

The aim of this chapter was to link our micro-approach to the macro-model in order to estimate the indirect effects of households changing their shopping behaviour and the distribution of these effects over different areas. Therefore, a bottom-up approach was used in which first the micro-effects of future developments were estimated, and these were then used as input for a multiplier analysis.

First of all, we looked at the impact of demographic developments between 2003 and 2010 and between 2003 and 2020 on household expenditures. For this exercise, we use the simulated 2003 population of Nunspeet, together with demographic prognoses at municipality level from Statistics Netherlands to simulate a micro-population for 2010 and 2020. It appears that the number of households is likely to increase in the whole region. In Elburg, the number of persons would also slightly increase, while in Nunspeet the population would decrease by almost 10% in 2020. Furthermore, especially in Nunspeet the share of older households would increase.

These simulated developments affect the total household expenditures in the region. Although, the total amount of expenditures would not really change between 2003 and 2020, the expenditures on grocery and fun shopping would slightly increase, and the expenditures on goal shopping would significantly decrease by 6%. Furthermore, in zone A, the total expenditures would decrease by 3%. This would mainly be the result of a large decrease in goal shopping. In the hinterland, zone B; the total expenditures would possibly increase by 4% in 2020. The strongest growth, of more than 5%, would be in fun shopping, and also the expenditures on grocery shopping would increase by 5%.

These changing household expenditures would not only cause direct effects in the retail sector but would also lead to indirect effects in other sectors and to income changes for households. We used the SAM retail multiplier of Nunspeet to estimate the indirect effects, as well as the allocation of the effects over the zones and the production factors. The multiplier shows that most of the indirect effects would affect wage-payments and income. In zone B, the growing population and increasing direct expenditures would result in a total economic growth of almost €280 thousand a month in 2010. However, at the same time, the economic loss in zone A would be −€70 thousand a month (including positive redistributive effects from the growing expenditures in zone B), almost −€1 million a year.

As a possible (precautionary) measure, the municipality of Nunspeet could decide to develop a new retail centre in the core of Nunspeet, which would increase total floor space by 12%. Because of this development, the local 2010 population would change its shopping behaviour, which would result in a positive total economic effect of €155 thousand a month. This would be enough to neutralize the negative economic developments of −€70 thousand a month that would be likely to take place in 2010. On the other hand, building a new retail centre in zone A decreases expenditures in zone B. However, because in zone B total population and total expenditures would rise, this small loss from the increased floor space in Nunspeet would only have a minor effect.

Apart from developing a new retail centre in the core of a town, the impact of out-of-town retailing (a new retail centre just outside Nunspeet or Elburg), was also simulated. Because this centre would not be developed in the existing towns it is not possible to use the behavioural model that was used in Chap. 3: an extra zone is required. Therefore, the model was extended with a 'new centre' zone with a specific amount of floor space (in total 4,600m extra) and distance to the existing towns depending on the location (near Nunspeet or near Elburg). In line with the literature, it appears that developing an entire new retail centre outside a medium-sized town, such as Nunspeet (Scenario 2), would result in a much larger significant change. The macroeconomic effects could sum up to a local gain of €4.7 million a year. However, the loss for the local Nunspeet economy would be as high as −€6.2 million a year.

When looking at these results, the conclusion is that out-of-town retailing can indeed cause significant losses for the retailers in the traditional town-centres. Both the direct and indirect effects are much higher when compared to retail developments in any of the towns. Almost two thirds of these losses would be at the cost of local firms, both retail firms and supplying firms. This confirms the concerns of local retailers; however, it also shows (to policymakers) that local income will not decrease and in total more expenditures of households will be retained in the local economy.

Chapter 8
Conclusions and a Roadmap to Future Research

Abstract Our modern space-economy is showing clear signs of far-reaching transformations, where the balance between urban and rural areas is at stake, both demographically and functionally. This study has addressed in particular the functioning of towns in modern rural areas.

It can be concluded that, today as well, small and medium-sized towns still have a central function in the regional economy. Nevertheless, the importance of towns is different for different actors and in different countries. To households they are particularly important for shopping, and to a lesser extent for working. The towns are most important to households with a low income, and to those that have lived in the local area for a long time. In this respect, it can be concluded that investments in facilities in towns are likely to reach the households who need such investments most. To firms, towns are indispensable as suppliers of labour, in particular for agricultural firms as an input market and for service-related firms as a sales market. Furthermore, national differences are apparent. In countries like the Netherlands, Poland and Portugal, the central function of towns for hinterland actors is somewhat less strong compared with England and France.

When thinking about future research, in particular the importance of economic diversity in rural areas and the optimal openness of firms to the wider economy is considered important. Other subjects are the dependency of rural areas on the public sector, as well as town-hinterland interactions in new Member States.

8.1 Introduction

Our modern space-economy is showing clear signs of far-reaching transformations, where the balance between urban and rural areas is at stake, both demographically and functionally. This study has addressed in particular the functioning of towns in modern rural areas. In general, a shift is taking place in rural areas from production to consumption activities. More households want to enjoy tranquillity, a healthy environment, and the rural idyll at a comfortable distance from large service

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centres. Therefore, an increasing number of urbanites are moving to towns in accessible rural areas. Other citizens 'commute' at the weekends to the countryside to spend their leisure time in a relaxing environment. Regarding the production side, it appears that, from an economic point of view, the agricultural sectors have lost their important position. However, as a manager of land and as 'one' of the production activities, agriculture is still indispensable. Furthermore, the service sectors are becoming more dominant, and values such as natural and cultural heritage are increasingly valued and appreciated by the public. In some countries, this shift is taking place faster, with a stronger impact on existing socio-economic structures than in others. Particularly in developing countries, but also in areas where other rural activities are not yet really present, a surplus of farm labour is emerging as a result of modernization and scale enlargement in the agricultural sector. Another point of attention is the scale enlargement of a range of facilities, such as retail, education, and health facilities. This often results in a growing dependency between city, town and hinterland. In itself, this is not a problem, but extra (transport) facilities might be necessary, while the presence of a certain level of basic services would be seen as necessary in smaller settlements.

The aim of this study was to contribute to the understanding of the contemporary function of towns in the rural economy and their potential role in rural development. Therefore, the multifaceted relationships between town-hinterland and the rural economy have been explored at different spatial levels and for different actors. Chapters 1–7 showed that in all countries towns do have a central function in the local economy, but to what extent this is so differs between households, farms and firms, between countries, and between activities.

8.2 Towns and Households

8.2.1 Importance of Town and Hinterland to Household Activities

When focussing on *the importance of town and hinterland to households concerning shopping, working, and living*. Chapter 3 showed that towns can be considered as important shopping locations, for both town and hinterland households: between 60 and 80% of the purchases of town households, and between 40 and 60% of the purchases of hinterland households are bought in town. In particular, pharmaceutical products and health care services are obtained in the central town. However, hinterland households often buy everyday products and services, such as food and groceries, domestic help, childcare, as well as hairdressing (partly) in the hinterland. Only in the Netherlands do hinterland households shop more in the hinterland itself than in town.

When looking at the local economy as a place of work, it appears that the hinterland is relatively less important for town and hinterland households as a place of work than as a place of shopping. However, in all countries the town is

the most important place of work for town households, with between 45 and 95% of those households having a job there. Furthermore, in England and France, the town is also the most important place of work for hinterland households, while in the other three countries most employment opportunities are found in the hinterland. In general, for all households, the government (public sector) is the most important employer; other important sectors of local employment are construction and retail. Only in Poland do most households have a job in the agricultural sector.

Concerning town and hinterland as a place to live, it appeared that households more often choose to 'only' live in the hinterland, without doing any shopping or having a job there. Of the town households, just between 2 and 15% do not shop or work in town. In contrast, of the hinterland households, between 26 and 69% do not shop or work in the hinterland. For most of these hinterland households, the town has a central function.

From this, we can conclude that towns are still important places to work and shop for town households and also, but to a lesser extent, for hinterland households.

8.2.2 How Spatial Characteristics Affect the Shopping Behaviour of Households

In order to address *the way the spatial characteristics of town and hinterland affect the behaviour of households, in particular their shopping behaviour*, the second part of Chap. 3 used insights from the literature and the regression analysis explaining the distribution of household's purchases over town and hinterland in all 30 towns, in order to develop a multinomial logit model (MNL) for the Dutch households.

Although the regression analysis indicated that both socio-economic and location factors are relevant in determining the shopping behaviour of European households, the MNL model showed that for Dutch households the location factors are particularly important. General location factors, such as distance to the shops and floor space, are important for all kinds of shopping, but mostly for grocery shopping. As expected, a shorter distance to the shops and more floor space make a location more attractive to households. The town-specific dummies related to the attractiveness of shopping in the rest of the world are only relevant for fun shopping, which is no surprise, given the importance of this zone for fun shopping.

Place of work appears to be the only socio-economic factor that is significant for all three kinds of shopping. This implies that, when extra jobs are created in one of the zones, this would result in increasing expenditures in that zone as well. Contrary to what was expected from the literature, the variable age did not significantly affect the shopping behaviour, but, instead, the length of residence did: in particular, a positive effect on (local) grocery shopping was found. Furthermore, level of income is particularly relevant for fun shopping: households with a higher income shop more often in the ROW, and car ownership is relevant for (local) goal shopping.

8.2.3 Economic Importance of Different Groups of Households to the Local Economy

The third research question focussing on households asked about *the importance of different groups of households to the local economy*. In Chap. 3, both the regression analysis and the MNL model showed that households living for a relatively long period in their local area tend to buy more in town and hinterland shops, and that households with higher income buy, on average, less in the local economy. Chapter 4 used a SAM approach to show town and hinterland relations of firms and households. The multiplier analysis shows the effect of the recirculation of spending within the region: households use some of their income for consumption spending in the local economy, which results in further local income and employment. It appeared that, in all countries, the income multiplier of town households is higher than that of hinterland households. This is because, in general, town households make more purchases in the local economy. Furthermore, in line with the findings in Chap. 3, the multiplier analysis showed that households with lower incomes are more integrated in the local economy; the lower the income, the higher the multiplier effect. This effect appears in all countries, and, in both town and hinterland, and the differences are significant. This means that if, for example, the government were to raise the lower incomes, the local effect would be significantly higher than if households with high incomes were to be advantaged.

8.2.4 Effect of Future Demographic Developments on the Expenditures of Local Households

The fourth and last research question focussing on households dealt with *the effect of future demographic developments on the (total) expenditures of local households*. In Chap. 7 the micro-model SIMtown was combined with the macro-model SAM. First, SIMtown was used to simulate the future population (of 2010 and 2020) of Nunspeet and its hinterland. According to these simulations, the number of households is likely to increase in the whole region. In Elburg, the number of persons would slightly increase as well, but in Nunspeet the population would decrease by almost 10% in 2020.

These simulated developments affect the total household expenditures in the region. Nevertheless, the total amount of expenditures is not expected to really change. Only expenditures on goal shopping would significantly decrease (by 6%). However, the distribution of expenditures over the zones would slightly change: in zone A total expenditures would decrease by 3% in 2020, and in zone B the total expenditures would possibly increase by 4% in 2010, and then they would decrease by 2% in 2020 (+2% in 2020 compared with 2003). Because these changing household expenditures affect not only the retail sector, but also the

supplying sectors and household (labour) income, the SAM retail multiplier was used to show the macroeconomic effects. It appears that, for the total local economy in 2010, the macroeconomic effect of the changing population would be positive (€2.8 million a year): the increasing expenditures in zone B would outweigh the decreasing expenditures in zone A. However, in 2020, there would be a negative local effect of −€ 0.5 million a year, and in Nunspeet the loss would be as much as −€3 million a year. Two-thirds of this loss would be redistributed to other sectors, but one-third would go to households in the form of less wage-payments and income.

From this analysis we can conclude that future population developments would have different effects on different towns. In the case of Nunspeet the expected decreasing population could result in significant losses for the retail sector if no measures were taken.

8.3 Towns and Farms and Firms

8.3.1 The Importance of Local Networks to Firm and Farms

To address *the importance of local networks to firms and farms, i.e. the importance of town and hinterland for local firms and farms*, first of all, in Chap. 4 integration indicators were derived. These indicators show the relative importance of the local economy to firms and farms of comparable size in terms of employment. When looking at the local integration indicators of the expenditures of firms and farms in the five European countries it appears, first of all, that there are some clear national differences. In general, businesses are less integrated in England compared with Poland and Portugal. However, in all five countries the difference between farms and firms of different sizes are very similar. In each country the share of local expenditures of farms is larger than that of firms; furthermore, the share of smaller businesses is in general higher than that of larger businesses.

This analysis suggests that farms are particularly important to the local economy, because the share of local inputs is larger than local outputs. In addition, in absolute terms the local expenditures and sales are also relatively high. However, although the local integration indicators of larger firms are smaller than those of small and medium-sized firms, large firms with more than ten employees (FTE) also obtain large quantities of inputs (in absolute terms) on the local market. In addition, because of their stronger national and international integration, they are more likely to bring new knowledge and innovations into the local economy which make them very important as well.

In Chap. 5, SAMs were first used as an analytical tool, showing the share of production sold to the local economy, as well as the share of inputs (including labour) obtained from the local area. It appears that, on average, for all 30 towns,

local sales networks are more important to town firms: 27% of total sales are sold in the local economy, against 15% of total sales of hinterland firms. In addition, local supply (including labour) networks are more important to hinterland firms: 27% of total input is bought in the local area, against 20% of the inputs of town households. When looking at the differences between sectors, it appears that both manufacturing and services sectors buy around 20–25% of their inputs on the local market. Only the agricultural sector buys as much as 34% of its inputs locally. The share of products sold on the local market differs much more with respect to the location (zone) and the kind of sector: service sectors in town sell as much as 42% to the local market, the agricultural and service sectors in the hinterland only 14%. Apparently, town firms 'use' the local area more as a place to sell their products, in particular the service firms, and hinterland firms use it as a place to obtain around a quarter of their inputs.

8.3.2 Key Sectors to the Local Economy

In this study, key-sectors were defined as sectors with above average (local) forward and backward linkages, which contribute significantly to the local economy. This means that they have both high output multipliers and a high share in total town or hinterland production output. On average, in all 30 towns, the output multipliers range from 1.2 to 1.7, and the share of sectors in total output ranges from 1 to 16%. It appeared that one sector can quite clearly be identified as a key-sector. This is the public administration, education and health sector. Already in Chap. 3, this sector appeared to be the most important employer in town and hinterland and in Chap. 4 it also appeared to be an important factor influencing off-farm employment. Particularly in Portugal, Poland and England, this would be a good sector in which to invest (public) money in order to reinforce the local economy. Another important sector in both town and hinterland is the retail and wholesale sector which can be considered as a key-sector especially in Poland, the Netherlands and France. In the hinterland, the manufacturing sectors are also important, mainly the construction and the metals and machinery sectors.

In the literature often the tourism-related services, such as the hotel and catering sector, are considered as key-sectors in rural areas. However, according to this study, although these sectors do have high multipliers, their contribution to the economy is rather limited. Nevertheless, they can have a significant impact on local employment, and therefore be of importance. In addition, the agricultural sectors also have relatively high multipliers but a limited production output. Only in Poland can some of these sectors be regarded as key-sectors.

All in all, we can conclude that, today, the service-related sectors, and in particular the public administration, education and health sector and the retail and wholesale sector have become key-sectors to the local economy, in both town and hinterland.

8.3.3 Future Developments in the Retail Sector and the Effect on Local Output

Finally we focused on *how future developments affect the output of the retail sector in small and medium-sized towns*. The answer to this question was described in Chap. 7. Section 8.3.1 has already described the effects of future demographic developments on the retail sector in town and hinterland. The results showed increasing expenditures in the local area in 2010 but a small decrease in expenditures in the local area around 2020. Furthermore, the losses in the Nunspeet retail sector are expected to be quite significant, as a result of its decreasing population.

In the second part of Chap. 7, the effects of new retail developments were simulated. First, we simulated the effect of a new retail centre in the core of Nunspeet (total floor space in zone A would increase by 12%). Because of this development, Nunspeet would become a more attractive shopping location for the local (2010) population, which would result in a positive total economic effect of €1.3 million a year. This would be more than enough to compensate for the negative effects of the demographic developments that are likely to take place in 2010.

As well as developing a new retail centre in the core of a town, the impact of out-of-town retailing (a new retail centre just outside Nunspeet or Elburg) was also simulated. Because this centre would not be developed in the existing towns it is not possible to use the behavioural model that was used in Chap. 3: an extra zone is required. Therefore, the model was extended with a 'new centre' zone with a specific amount of floor space and distance to the existing towns. If the new shopping area were to be developed just outside Nunspeet, the macroeconomic effects would sum up to a local gain of €4.7 million a year. However, the loss for the Nunspeet economy would be as high as −€6.2 million a year. The reason for this is that these out-of-town developments create (totally) new opportunities for the households, often decreasing the distance, and therefore the travel costs (in time or money), to convenient shopping areas. Interestingly, the loss in Nunspeet would mainly be a loss of output and factor payments, but local household income in Nunspeet is expected to even increase slightly.

Apparently, the doubts of many local authorities about out-of-town retail developments are not misplaced regarding the financial losses for town shops. However, the simulation also showed that the total local effects are positive. In line with the literature, it appears that developing an entire new retail centre outside a medium-sized town, such as Nunspeet, would result in a much larger negative change to the town centre compared with if it were to be developed in the core of the centre.

8.4 The European Scene: National Variability

It appeared that, in all countries, towns have a central function, but there are some national differences. In general, in England and France both firms and households use the local economy less intensively than in the other countries. Instead, the larger

cities in the ROW are relatively important. Nevertheless, the towns do have a clear central function: particularly for the hinterland households, the town is the most important place to shop and work. Of the hinterland households in England and France, around two-thirds do not shop or work in the hinterland. Instead, more than 75% of them go to the town.

In Poland and Portugal, the local economy is, in general, much more important. For example, more than 90% of the Portuguese town households have a job in town. In these countries the larger cities in the ROW are far less important; in Portugal less than 10% of the town-households have a job in the ROW against 40% of the English town households. However, in Poland and Portugal the hinterland also offers many facilities, in particular (agricultural) jobs. This means that, for these hinterland households, facilities in towns are less necessary compared with England and France.

In the Netherlands, it would appear that, the towns are least important. For town households, towns do offer an adequate amount of facilities: they buy more than 60% of their purchases in town, and more than 40% of town households have a job there. However, the hinterland, and to a lesser extent zone C, offer many facilities as well: the Netherlands is the only country in which hinterland households spend more money in the hinterland than in town. Nevertheless, the hinterland households shop and work more in town than vice versa, which indicates that in the Netherlands as well, towns have a central role.

Another important issue when dealing with national differences is the importance of local labour. In England, for example, around 20% of firms' local expenditures are paid to local wages. In the Netherlands, however, this is as much as 60%, indicating the importance of this local resource. When looking at the output-multipliers and the distribution of a shock over the different accounts, it appears that in England and France most of the effect ends up in the production accounts, while in the Netherlands, Poland and Portugal the effect on the factor (wage) and income accounts is significantly stronger. In these countries, the production, factor, and income accounts, both in town and hinterland, are more strongly integrated, which results in higher multipliers.

Furthermore, it appears that, in many towns, particularly in the Netherlands and Portugal, the number of jobs (and shops) in the hinterland is larger than in the towns. In these two countries, on average the hinterland economy is larger than the town economy. In England, France, and Poland, total monetary flows in the town economies are larger. However, in all five countries, the monetary flows from town into hinterland are (at least) twice as big as the flows from hinterland to town.

It is often thought that, especially in the less developed areas, the economy is less open and more locally-oriented, which strengthens the importance of towns. When the 30 towns in the five countries are compared, it appears that the situation in England and France is rather similar, as is it in Poland, Portugal and the Netherlands. In the first two countries, the number of facilities in the hinterland and in zone C is relatively small. Instead, many activities take place in the cities which are relatively easy to access. But, in Poland, Portugal and the Netherlands,

the hinterland accommodates many facilities. However, the economic situation in these countries is very different: in Poland, and to a lesser extent in Portugal, the agricultural sector is still a dominant sector with strong local networks, while the Netherlands has a more modern service-based economy.

8.5 The Importance of Towns to the Rural Economy

Now that all the research questions have been answered, one final and fascinating question remains: How important are towns to the rural economy and to rural development. According to the well-known Central Place theory of Christaller (1933), the settlement hierarchy reflects the variation in thresholds and complementary regions, such that those settlements higher in the hierarchy offer both higher- and lower-order goods, thereby serving a wider complementary region than settlements at the bottom of the hierarchy, where only lower-order goods are available. Although this theory has often been criticized, from the results of this study, it can be concluded that, today as well, small and medium-sized towns still have a central function in the regional economy. First of all, the analyses of the multifunctionality of towns to households showed how towns are especially a place where it is possible to obtain pharmaceutical products and health care services which cannot be acquired in the hinterland. Also a significant amount of other high-order goods, such as clothes and shoes, are bought in town. Low-order products, such as food and groceries, domestic help, and hairdressing, can often be obtained in the hinterland. Furthermore, on average, the town economy is larger in terms of intraregional monetary flows than the hinterland economy (only in the Netherlands and Portugal is it the other way around). In addition, in all 30 towns, the flows from town to hinterland are twice as big as the flows from hinterland to town, which illustrates that the central, servicing, function of towns in Europe still continues to exist.

Nevertheless, the importance of towns is different for different actors and in different countries. To households they are particularly important for shopping, and to a lesser extent for working. The towns are most important to households with a low income, and to those that have lived in the local area for a long time. In this respect, it can be concluded that investments in facilities in towns are likely to reach the households who need such investments most. To firms, towns are indispensable as suppliers of labour, in particular for agricultural firms as an input market and for service-related firms as a sales market.

Furthermore, national differences are apparent. In countries like the Netherlands, Poland and Portugal, the central function of towns for hinterland actors is somewhat less strong compared with England and France. A plausible explanation for this is that the network of settlements in these countries is relatively fine-meshed, and that both actors and facilities are more evenly distributed over the (rural) area. However, at the same time, in these three countries, the different groups of actors are more strongly connected to each other, resulting in more interaction and higher multiplier effects. This means that, even though in Portugal, Poland and the

Netherlands the central function of towns to hinterland actors is less significant and in England and France the interaction between local households and firms is weaker, in all countries towns can be regarded as important to the rural economy, and therefore they should be considered as useful tools in rural development policies.

8.6 A Road Map for Further Research

This study has highlighted many features of the changing roles of towns in rural areas. But, of course, certain aspects still remained unexplored. Given the importance of towns to local actors, as well as to policy makers, several issues are worth further investigation. In this study, many conclusions have been drawn regarding the spatial behaviour of households and the position of towns. This behaviour appeared to be different for town and hinterland households, for households with a low income, and for those with a high income, and for different activities. Nevertheless, the micro-behaviour of firms has not been extensively investigated in this research. We did address part of their behaviour on a macro-level, revealing some of the national differences and differences between sectors, but no other characteristics were taken into account. Although we now know which sectors can be indicated as key-sectors, it is not clear what kind of firms could be indicated as key-firms. From Chap. 4, it appeared that smaller firms are more embedded in the local economy, but other characteristics, such as the age of a firm, or the place of residence of the owner, could also have a significant impact. With the growing interest for new economic activities in rural areas, it is very important for policy makers and local municipalities to know which kind of firms to attract. Therefore, more insight into the spatial behaviour of local firms would be of great interest.

Furthermore, a search for an optimum between openness and closeness (or a local orientation) would be relevant. On the one hand, it is important for firms to have local networks which they can trust. On the other hand, to learn from (inter) national developments can really contribute to the innovativeness and competitiveness of a business. This holds not only for single firms but also for towns as a whole. In this perspective, the earlier mentioned economic diversity, often stressed in rural policies, could not only contribute to a spread of economic risks, but could also make it possible to have businesses that forge local relationships and trust together with businesses that are more open to new ideas about, for example management and production processes.

Another issue that needs further research is the importance of, and the dependency of rural areas, on the public sector. Chapters 3–5 showed that the public sector is of significant importance to the local economy: many households have a job in this sector, and it has also been indicated as a key-sector in all five countries. It would be interesting to find out whether a net inflow or outflow of public finances is taking place in rural areas, and how this is different from the importance of the public sector to more urbanized areas.

Of course, not only firm-related subjects require further research. In this study, we analysed the spatial shopping behaviour of households according to three different kinds of shopping; grocery, fun, and goal shopping. Although the different parameter-values belonging to the same variables justify this distinction, it can not be ignored that some shopping trips are multipurpose, and that the presence of various kinds of shops in a shopping centre can make an area more attractive in general. In this light, further research is needed about the effect of the presence of different kinds of shops on grocery, fun, and goal shopping, and about the degree to which shopping trips in rural areas are multipurpose in general.

Furthermore, related to shopping, but also to other activities, future developments in the new European Member States need special attention. From our findings it is plausible that the importance of towns depends both on spatial and economic circumstances. First of all, it would be useful to find out to what extent, and in which way, these two groups of circumstances are related to the importance of towns. Secondly, since many spatial circumstances, such as settlement structure, are rather fixed it would be interesting to transpose some of our socio-economic findings, such as the spatial shopping behaviour of Dutch households, to the Polish or Portuguese situation. With the help of, for example, a scenario approach this could result in valuable explorations of future developments.

Finally, in this book we looked at the importance of small and medium-sized towns for local actors, and it appeared that they are quite important. However, the results have not been compared with, for example, the importance of larger towns or cities to their local actors. To put the results of this study in a broader perspective, either a meta-analysis of earlier published studies or additional research is necessary. Another way of putting this study in a broader perspective would be to analyse the results over time. The methods that have been used in this thesis, in particular the SAMs and the (static deterministic) spatial microsimulation are relatively static and only describe the situation at a certain moment in time. One way of adding extra value to the results of this study would be to update the SAMs with recent (secondary) information, and compare them with the 2003 models. Another way could be to select a sample of the households and firms that are part of the database used in this study and ask them the same questions again so see what has changed. A final way of comparing the results with future developments would be to extend the microsimulation model, SIMtown, with a dynamic module. With the help of such a module, the households currently living in the towns could really change and develop (getting older, having children, or moving) until they form the future population. In particular in relation to the expected future population decline in many western countries, this extension could be very important. Although these suggestions, which would enable the results of this study to be put in a broader perspective, would require substantial input, they would generate new intellectual challenges of a conceptual and methodological nature and significantly improve the understanding of spatial interactions in town and hinterland.

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