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EVALUATING TOURISM EXTERNALITIES IN DESTINATIONS: THE CASE OF ITALY

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Abstract

The present work analyzes tourism externalities in Italy, fifth country in the world and third in Europe for international arrivals (UNWTO, 2014). The main purpose is to empirically investigate on the relationships between tourism and externalities generated in tourist destinations.
The thesis in divided into five chapters. Chapter 1 analyzes the theory of externalities and provides some examples of tourism externalities. In addition, a review of the literature is examined in order to highlight the lack of empirical analyses for European cases and in particular for Italy. Chapter 2 shows the main research questions, motivations and three cases study. In the last section of the chapter the main reasons are illustrated for analyzing the Italian case as suitable for the purpose of the present work. Chapter 3 focuses on the relationship between tourism and crime at Italian provincial level. Chapter 4 describes the link between tourist sector and house prices in Italian provincial capitals. Chapter 5 is devoted to the application of a method for policy evaluation on the impact of tourist taxation on tourist flows. Since taxation is usually employed in order to internalize environmental externalities, it is explored its distortive effect on tourist demand at municipality level. The case under analysis is Villasimius, Sardinian tourist destination. To do this the recent methodology of *Synthetic Control* is used.
This study provides some evidence that a positive and significant link between crime and tourism exists. This indicates that tourism generates in the tourist destination not only benefits but also costs, such as those relative to the increase of criminal activities. Furthermore, the empirical analysis performed in Chapter 4 by using the Generalized Method of Moment (GMM), highlights that property prices in Italian cities can be affected by tourism activity. Finally, after evaluating the introduction of tourism taxation, results demonstrate first hints about the non-negative taxation effect on tourist flows.

"Tourism's impacts typically are grouped into three categories: economic, sociocultural, and environmental/ecological (Bull 1991; Pearce 1989; Ryan 1991). Tourism's non-economic (i.e., social and environmental) impacts can be either positive or negative (Bull 1991:163)" [Lindberg and Johnson, 1997].

Introduction

International and domestic tourism demand has grown overtime and tourism represents one of the most important sectors worldwide. According to the World Tourism Organization (UNWTO henceforth) [1] data, in 2012 tourism receipts generated by tourism sector were 840 billion of euros and in 2013 international tourist arrivals reached 1,087 million. In the 1975-2000 period, international arrivals have increased at an average page of 4.6% per year (UNWTO, 2011). With approximately 47 million international tourists, Italy is the fifth most visited country worldwide after France, United States, China and Spain; and it ranks third within Europe (UNWTO, 2014).

In the academic literature the impact of the tourism sector on the economy is confirmed. Indeed, a wide strand of research finds a positive linkage between tourism and growth for developed and developing countries, in the short and in the long run. This is famous as *tourism led growth hypothesis* and has firstly been tested by Balaguer and Cantavella-Jordà (2002) for Spain. Following Balaguer and Cantavella-Jordà (2002), other scholars seek to investigate this relation between tourism and economic growth both in Europe (Greece, Cyprus, Spain, Italy and Portugal) and in Latin America (Chile, Mexico, Colombia and Uruguay). It is worth to notice that all these studies have in common the evidence that - in the long run - international tourism demand is an important driver for the economic growth and, in addition, the causality is unidirectional (Granger causality) [2].

But, even thought the economic growth mentioned above, tourism could generate also other impacts on tourist destinations, such as externalities. From the

[1] World Tourism Organization (UNWTO) is an agency of the United Nations. It is responsible for the promotion of sustainable and responsible tourism as a driver of economic growth, development and environmental sustainability. Currently members of UNWTO are one hundred and fifty-six countries, six associate members and over four hundred affiliates representing tourism associations, institutions, local authorities and private sector (www2.unwto.org).

[2] For an extensive literature review on tourism led-growth hypothesis see Bimonte *et al.* (2012).

economic approach, an externality occurs when the well being of a consumer or the firm production possibilities are directly affected by the actions of another agent in the economy. According to Stabler *et al.* (2010) a tourism externality occurs when the consumption or production decision of one party unintentionally affects the utility of another consumer or the output revenue and profit of another producer. The most important point is that the party benefiting from the externality does not pay to the party conferring it, and equally the party suffering from the externality does not receive compensation for this. Specifically, tourism sector might generate positive or negative externalities on destinations. On the one side, the increasing demand for the tourism good and the composite characteristics of the tourism product boost local economy and make residents better off. On the other side, the same features might generate negative environmental, economic or social externalities that make residents worse off. When these negative impacts are not properly taken into account, tourism-led development becomes unsustainable. The reasons of this strong impact at national and regional level have to do with the characteristics of the tourism: *"a range of goods and services which are purchased and/or used in sequence, such as reservation agencies, financial services, acquisition of specialized clothing and equipment, transportation, accommodation, food and human-made and natural attractions"* (Stabler *et al*., 2010; p. 5)[3]. Therefore, the composite nature of tourism is explained by the presence of non-traded goods and includes both man-made (historic cities, heritage buildings and monuments) and natural amenities (e.g. beaches, seas, mountains, lakes and forests).

Empirical research about tourism externalities could be divided into two main strands. The first focuses on the perception of residents on tourist destinations, while the second one employs econometrics in order to quantify the impact of tourism. By using surveys, economists and other social scientists suggested first hints on the impact that tourism generates on resident population (Liu and Var, 1986; Milman and Pizam, 1988; Ross, 1992; Haralambopoulos and Pizam, 1996; Akis *et al.,* 1996; Tosun, 2002). On the other side, quantitative applications have been provided in recent years, such as for instance contingent valuation, cointegration analysis, generalized method of moment, structural equation models. Findings of this second strand of research give a measure of the impact about negative and positive externalities. The main negative externalities analyzed include increase in crime rate (McPheters and Stronge, 1974; Montolio and Planells, 2013; Biagi and Detotto 2014); destruction of environment and natural amenities (Lindberg and Johnson, 1997; Taylor *et al.,* 2005); Dutch disease (Capò *et al.*, 2007; Chang *et al.,* 2011). While positive externalities are synthesized into

[3] In the first edition of the book, authors described tourism as "*a range of goods and services which are consumed in sequence, including transportation, accommodation and natural resources"* (Sinclair and Stabler, 1997; p. 1). The different definition, twelve years later, indicates that tourism activity is a sector in which rapid changes occur.

the concept of *tourism led growth hypothesis* (Balaguer and Cantavella-Jordà, 2002; Dritsakis, 2004; Louca, 2006; Nowak *et al.*, 2007; Brida *et al.* 2008, 2009, 2010; Proença and Soukiazis, 2008; Cortés-Jimenez and Pulina, 2010; Seetanah, 2011; Bimonte *et al.* 2012).

The present work focuses on three empirical explanations on the relation between tourism and: 1) sociocultural externalities, such as crime in the Italian provinces; 2) economic externalities, such as house prices in 103 Italian provincial capitals; 3) environmental externalities, by investigating a possible solution, such as the tourist taxation (*Imposta di soggiorno*)[4] in a specific case study on a Sardinian seaside destination. Specifically, the positive relationship between tourism and crime has been confirmed by several researches in the past decades. In the 1970s–1980s, scholars debated on the role of tourism in increasing crime rate at tourist destinations. Indeed, results of very tourist destinations such as Miami, Hawaii and Australia, defined the significant and positive role of tourism (McPheters and Stronge, 1974; Fukunaga, 1975; Fuji and Mak, 1980; Walmsley *et al.,* 1983). European cases have been analyzed only in recent years. Spain and Italy (Montolio and Planells, 2013; Biagi and Detotto, 2014) have been object of two studies, in which the link is emphasized. As far as the Italian case is concerned, more research is needed on this topic, due to the fact that the paper by Biagi and Detotto (2014) only uses a cross section of provinces and does not consider the dynamic of the relation along with the persistence of the crime.

In addition, since tourism destinations worldwide have experienced inflows of national and international recreation capital as a result an increase of demand for recreation services and holiday accommodation occurs – the latter both for use and investment purposes. This increase in demand for holiday housing has been the result of socioeconomic changes, such as the expansion of wealth, increase in the lifetime flow of earnings (Müller *et al*., 2004; Müller, 2002; Williams *et al*., 2000), longer periods off and greater value given to leisure time and the rising number of retirees with disposable time and income (Norris and Winston, 2009)[5]. Moreover, and particularly in the case of international tourism, this process has been aided to a great extent by improved access to communication and transportation (Gustafson, 2002; Magalhaes, 2001; Williams *et al.,* 2000) as well as the formation of a globalized property market facilitating the purchasing

[4] Sardinian government imposed for the first time the tourist taxation by the regional law of 29th May 2007, n.2, art. 5.

[5] Williams *et al.* (2000) study the flows of international retired people from UK to four main destinations: Tuscany in Italy, Malta, Costa del Sol in Spain and Algarve in Portugal. Muller (2002) analyzes the development of German second home ownership in Sweden between 1991 and 1996. Muller *et al.* (2004) summarize the literature on the impacts of second home tourism on the rural economy, culture and environment. Norris and Winston (2009) focus on the case of Ireland and the growth in second homes since the mid-1990s. It is broadly supported that research interest in second homes has had a new boom since the late 1990s, due to the fact that habits of people are changed.

process of properties abroad (Williams *et al*., 1997)[6]. In several cases, weak currencies in host communities (Hines, 2001) have also played an important role in the increase in demand for recreation accommodation – as this was also viewed as an income-generating/investment opportunity. As a consequence, local housing markets have felt the pressure of quantitative and qualitative changes following the increased demand for already existing housing stock as well as increasing interest from developers for the provision of new accommodation. However, studies that attempt to quantify the overall effect of tourism activity on the housing market and empirically test the relationship between tourism and house prices are limited. These studies are mainly based on evidence from the US and focus on a cross-sectional rather than dynamic relationship between tourism activity and house prices. The relation described above between tourism and house prices is broadly recognized in tourism economics and housing literature. Nevertheless, in Italy this correlation has been estimated for the first time by Cannari and Faiella in 2008. However, the analysis is not exhaustive and needs more investigations. Some years later, Biagi *et al.* (2012) confirm the significant and positive effect of tourism on house prices. This exercise focused on Sardinian municipalities, denotes the relevance of the topic and, at the same time, suggest more explorations.

Furthermore, tourism can affect destination environment generating negative externalities. In this context, scholars have been unanimous in recognizing the impact that produces a large number of visitors concentrated in the same destination at the same time (Archer *et al.*, 2005; Schubert, 2009; Stabler *et al.* 2010). Since the most suitable solution in case of the presence of this externality is the tourist taxation, a strand of research has developed from the late '70s in order to evaluate the effect of the tax on tourist flows. The use of tourism taxation is a common solution in order to internalize externalities. For this reason it is applied in several tourist destination such as Hawaii, US, Mauritius and in the majority of European countries. Tourism taxation can be announced that does not affect tourist flows? In analyzing the literature, it seems quite clear that the effect depends on different characteristics of destinations. Mak and Nishimura (1979) for the case of Hawaii, Combs and Elledge (1979) for US, Gooroochurn and Sinclair (2005) for Mauritius affirm that tourism demand is not affected by tourist taxation. Conversely, Durbarry and Sinclair (2001), analyzing the United Kingdom market, argue that tourists are sensitive to tourist taxation and this generates a decrease in tourist expenditures. In other words, the debate is open and further analyses are required at the more detailed level. In particular in Italy,

[6] Williams *et al*. (1997) investigate on the international retirement migration (IRM), with particular regard on flows from North to South Europe (from UK to Italy, Malta, Spain and Portugal). Magalhaes (2001) examines the role of British property consultants in consolidating a transnational market for property in Europe, specifically for Madrid and Milan. Gustafson (2002) conducts a survey on Swedish retirees that are winter residents in Spain.

where a recent law introduced the tax at municipality level[7] for capitals of the province, part of a group of municipalities, tourist municipalities and cities of art.

Results of the past empirical literature on tourism externalities confirm, on the one hand, the relevance of the issue and, on the other hand, the lack of empirical studies for European countries and in particular for Italy. Indeed, the most part of studies are focused on US cases and only recently European countries have been taken into account. In this contest, it is important to notice that Italy is a tourist country. In 2013 it ranks third in Europe after France and Spain for international tourist arrivals with a positive trend also for the tourist supply. Second Italy represents a case of heterogeneity in terms of urban characteristics. Different groups of cities, such as art cities, seaside destinations, environmental specific and unique sites, determine the tourist supply and the different level of tourist development. Third, only few previous studies have applied the Italian case to check tourism externalities at urban level (Biagi and Detotto, 2014; Cannari and Faiella, 2008; Biagi *et al.*, 2012. Finally, the fourth reason for choosing Italy as case study is the availability of data.

For these reasons, the questions explored in the present work are three. First, the empirical evidence on the positive relation between crime and tourism in Italy; second, the positive link between tourist sector and house prices in Italian cities; third, the effect on tourist flows of the tourist taxation in an Italian tourist destination (Villasimius, Sardinia). Therefore, the purposes of this work are investigated by using suitable econometric techniques and appropriate databases.

The present study is structured into five main chapters. Chapter 1 focuses on theories of externalities and tourism externalities. It starts by defining externalities and provides an overview on consumption and production externalities, along with negative and positive externalities and possible solutions to the problem. Specific attention is given to tourism externalities and findings of empirical research. A critical review of the literature is presented in a specific section.

Chapter 2 is devoted to the findings of the empirical research regarding negative/positive effects generated by tourism on tourist destinations, which are the main focus of the present work. In the second part of the chapter research questions and main contributions of the present study are illustrated. Finally, key motivations are listed on the choice of Italy as case if study for the purpose of the present dissertation.

Chapter 3 examines the relationship between crime and tourism in 95 Italian provinces over the period 1985-2003. The methodology of panel data is presented in a detailed way starting from the difference between fixed and random effect, static and dynamic panels, to endogeneity, serial correlation and unit root problem. The empirical strategy followed (Ordinary Least Squares, OLS, two

[7] Legislative decree 23/2011.

Stage Least Squares, 2SLS and Generalized Method of Moment, GMM-System), data used and a comment of results are presented.

Chapter 4 investigates on the effect of tourism activity on local house prices in 103 Italian provincial capitals for the period 1996-2007. In the first part of the chapter a review of the literature is offered. Follow a description of the variables used, the general and empirical models, along with the methodology (GMM-System). Finally, econometric results and some policy implications are remarked.

Chapter 5 presents a policy evaluation analysis on a specific case study concerning the application of the tourism taxation as an instrument to deal with environmental externalities. The case study concerns the municipality of Villasimius (Sardinia), where in 2008 has been levied a tourism taxation on tourist nights of stay in official tourist accommodation. The methodology used to implement the policy evaluation analysis, namely the Synthetic control method, allows one to evaluate whether the tax has affected tourist flows in the destination.

In the final part of the thesis are highlighted main conclusions of the entire study and further developments. This study provides the evidence that: 1) tourists generate an increase on crime in the destination; 2) tourism sector as a whole produces a raise in house prices at urban level; 3) tourism taxation as an instrument to internalize environmental externalities, does not affect negatively tourist flows in the case under analysis. The present results are the fruit of a panel analysis at urban level and this is the first time, as far as it is known, that these methodologies are applied to study the Italian case of tourism externalities.

CHAPTER I

Tourism externalities: theory and empirical research

1.1 Introduction

This chapter analyzes the theory of externality and tourism externalities. Several examples are listed along with the results of previous empirical research. In particular, the section 1.4 focuses on the link between the theoretical part and the empirical one, which is the most important part of the present work. Indeed, the critical analysis of the empirical research allows to critically assess what has been already found and what is missing in current studies.

The structure of this first chapter is the following: in section 1.2 it is shown a brief description of externalities theory and some solutions to the problem (subsection 1.2.1); in section 1.3 is analyzed the theory of tourism externalities and in section 1.4 findings and a critical review of the literature are presented.

1.2 Theory of externalities

In the economic literature it is well known that externalities can compromise economic efficiency in terms of market equilibrium. Indeed, in presence of externalities, competitive equilibria are not Pareto optimal. More strictly, one can say that the inefficiencies resulting from the presence of externalities are due to the nonexistence of certain commodity market (e.g. clean air).

In general, one can say that a consumer or a firm may, in some cases, be directly affected by the actions of other agents in the economy. The definition of externalities sometimes is not fully satisfying, Mas-Colell *et al.* (1995) suggest the following: *"An externality is present whenever the well-being of a consumer or the production possibilities of a firm are directly affected by the actions of another agent in the economy"* (Mas-Colell *et al.* 1995; p. 352). It is important to notice that in the definition above *"directly"* means that the externalities take place without any effects that are mediated by prices (Mas-Colell *et al.* 1995; p. 352). Externalities could be either positive (when the behavior of an individual causes benefits to others) or negative (when the behavior of an economic agent causes costs to others) and can be divided into:

- Consumer on consumer: when a consumer is directly interested on consumption of another individual;
- Consumer on producer: when a consumer is directly interested on production of another individual;
- Producer on consumer: when production possibilities of a firm are affected by choices of another individual;
- Producer on producer: when production possibilities of a firm are affected by choices of another firm.

Katz and Rosen (1996) reported four basic characteristics of externalities:

1) They are produced both by individuals and by firms;
2) They are reciprocal;
3) They can be negative or positive;
4) A level of pollution equal to zero is not desirable because it would lead to the total lack of production.

More in details, individuals produce externalities when they reduce (negative externality) or increase (positive) the well being of other uninvolved individuals by their actions. A classical example of negative externalities could be the consumption by consumer *i'*s neighbor of loud music at three in the morning that prevents his or her from sleeping[8]. On the other hand, an individual could produce positive externality by his flowering garden, of which his neighbors may benefit (Varian, 2007). An example of firms producing negative externalities is the case of a fishery's catch that may be impaired by the discharges of an upstream chemical plant (Mass-Colell *et al.*, 1995). However, firms can produce also positive externalities. It occurs when firm production positively affects the possibilities of production of another firm: for example when a plantation is located near the hives of a beekeeper.

Another characteristic of externalities is the reciprocity. Indeed, if property rights do not exist, it will be not clear the direction of the externality. In the example above, the neighbor that listened to music during the night affected the well being of the consumer *i*, but if the silence during the night is not a common right, the consumer *i* could affect the well being of the neighbor imposing to him the silence.

The positive or negative nature of the externalities is linked to the concepts of costs and benefits. On the one hand, positive externality produces some benefits on other agents in the economy; on the other hand negative externality generates some costs in the economy. Given this substantial difference, also solutions will be different between positive and negative externalities (see subsection 1.2.1)

Finally, according to Katz and Rosen (1996), the optimal level of pollution is a compromise between costs and benefits and this is found when the pollution is

[8] This example is reported by Varian (2007) and by Mass-Colell *et al.* (1995).

greater than zero. Indeed, in correspondence of zero pollution there is no production, because all production activities are - to some extent - pollutant.

In order to understand implications of external effects for competitive equilibria, it is considered a simple general equilibrium model, with two agents (*i =1, 2):* Consumer 1 and Consumer 2.

Then, it is assumed that the actions of consumers i's do not affect the prices $p \in \mathbb{R}^L$ of L traded good in the economy. At these prices, consumers i's wealth is w_i. It is also posited that each consumer has preferences not only over L traded goods $(x_{1i}, \ldots, x_{Li})$, but also over some action $h \in \mathbb{R}_+$ taken by Consumer 1. Hence, the utility function takes the following form:

$$u_i(x_{1i}, \ldots, x_{Li}, h) \tag{1.1}$$

And it is assumed that:

$$\partial u_2(x_{12}, \ldots, x_{L2}, h)/\partial h \neq 0 \tag{1.2}$$

Because the choice of h of Consumer 1 affects the well being of Consumer 2, it generates an externality. At this point, it will be useful to define for each consumer i a derived utility function over the level of h, assuming optimal commodity purchase by consumer i at prices $p \in \mathbb{R}^L$ and wealth w_i, as follows:

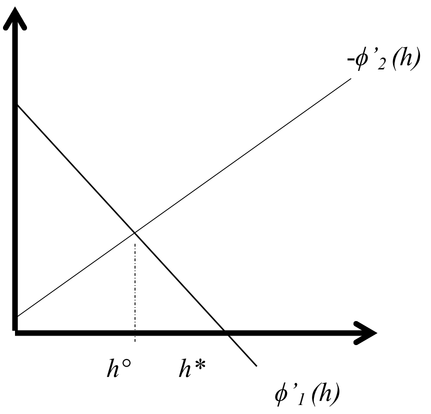
$$v_i(p, w_i, h) = \max_{xi \geq 0} \; u_i(x_i, h) \quad \text{s.t. } p \cdot x_i \leq w_i \tag{1.3}$$

The function utility can be rewritten without the *p,* because of prices of the *L* traded good are assumed to be unaffected by the changes:

$$u_i = \phi_i(h) \tag{1.4}$$

When the external effects exist, the equilibrium level of h is not optimal. Negative consumption externalities are generated when $h^*>h°$(see Figure 1.1), in contrast h represents a positive externality when $h^*<h°$. This means that a negative consumption externalities lead to overconsumption, while positive consumption externalities lead to under consumption.

Figure 1.1 The equilibrium (h*) and optimal (h°) levels of negative consumption externalities



Source: Author's elaboration on Mas-Colell *et al.* (1995)

In the figure above, the competitive equilibrium level of externality h* corresponds to the point of intersection between $\phi_1$and the horizontal axis; while the optimal externality level h° occurs at the point of intersection between two functions $\phi_1$and ϕ_2.

Although the example above explains the case of consumer externality, the same interpretation can be applied when the two agents are firms. In case of production externalities, there are two firms (*j =1,2*): Firm 1 and Firm 2. It is assumed that Firm 1 production affects the production of Firm 2, which is not compensated by the Firm 1. The firm *j* has a derived profit function:

$$\pi_j(p, h) \quad (1.5)$$

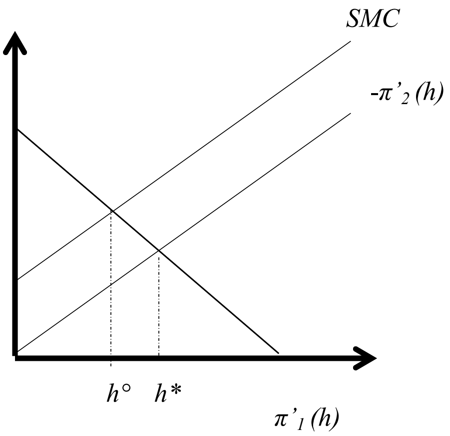
The function can be rewritten without the *p,* because of the prices are assumed to be unaffected by the changes:

$$\pi_j(h) \quad (1.6)$$

In this context the Firm 1 produces the quantity of *h* that affects the production of Firm 2, until the marginal cost to produce *h* is equal to zero. As a consequence when the external effects exist, the equilibrium level of *h* is not optimal. Negative production externalities are generated when h*<h° (see Figure 1.2). Indeed, the social marginal cost is above the private marginal cost and the social optimum quantity is lower that the competitive market equilibrium.

Negative production externalities lead to overproduction, while positive production externalities lead to underproduction.

Figure 1.2 The equilibrium (h^*) and optimal ($h°$) levels of negative production externalities



Source: Author's elaboration on Mas-Colell *et al.* (1995)

Another feature of externalities is the fact that, in same cases, they are produced by numerous parties. For this reason, this typology of externality is defined "multilateral" and include for example smog caused by cars, congestion and industrial pollution, which are all crucial problems in term of policy implications. Multilateral externalities can be *depletable* (or *private*, or *rivalrous*) or *nondepletable (*or *public*, or *nonrivalrous)*. The first one category has the characteristic that experience of the externality by one agent reduces the amount of the other agents. In contrast, the second category includes public goods, which have not *rivalrous* among individuals.

1.2.1 Possible solutions to the externalities problem

Are there solutions to this type of inefficiency of the competitive market outcome in presence of externalities? The solutions can be divided into private or public ones and are different for positive and negative externalities.

A first solution for firms could be a merging of the parties involved in the externality, and thus in this way "internalize" both costs and benefits due to it. In such case the new firm has the production control for all costs and, as a consequence, the profit maximization will be:

$$\max_{s,f,h} p_s s + p_f f - c_s(s,h) - c_f(f,h) \tag{1.7}$$

where:
$p_s s + p_f f$ is the total profit done by the profit of the first firm plus the profit of second firm;
$c_s(s,h) - c_f(f,h)$ is the total cost done by the cost of the first firm plus the cost of the second firm.

A second solution is known as the Coase (1960) theorem [9]. According to the economist, once established who owned the property right with regard to a particular good, then the bargaining between the parties will lead to an efficient use of this resource. Additionally, from the point of view of achieving efficiency it does not depend on which party is assigned the property rights, as long as is assigned those rights. However, the theorem mentioned above is not always able to guarantee the achievement of efficiency. In fact, this is based on the assumption that the bargaining costs are very low, and in reality this is not always true. Sometimes it is difficult to identify the cause of the damage and can be also difficult to know all the preferences and opportunities of each individual involved in the negotiations. For example, in case of multilateral externalities, such as industrial pollution, congestion and smog caused by car use and global worming, defining property rights is difficult.

With regard to public solutions, there are two possibilities: regulation or taxes/subsides.

In the first case, public authorities correct any externalities - for example, environmental - through the imposition of maximum pollution, and providing penalties for those who do not respect such limitations.

In the second case taxes are known as Pigouvian taxes, after Pigou (1932)[10]. They are taxes imposed on each unit produced by a firm that generates pollution and are equal to t_h for each unit of pollution.

$$t_h = -\pi_2'(h°) > 0 \tag{1.8}$$

The maximization problem for the firm will be:

$$\max_{s,h} p_s s - c_s(s,h) - t_h \tag{1.9}$$

[9] Ronald H. Coase won the Nobel Prize in Economic Sciences in 1991 "*for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy*" (www.nobelprize.com).
[10] Artur Pigou (1877-1959) was an economist of the Cambridge University; he described for the first time this kind of tax in the book *The Economics of Welfare.*

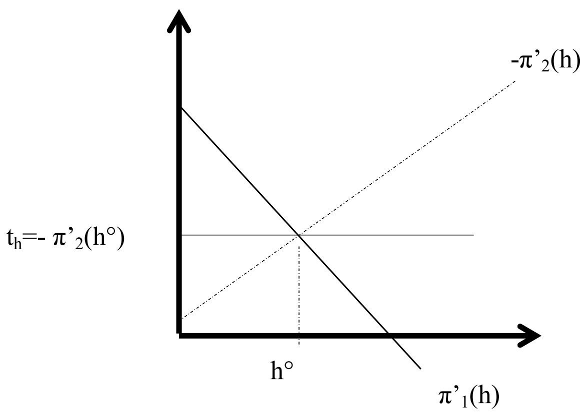
in which the difference between (1.7) is that now the firm is only one and the total amount of the tax t_h is deducted by the profit. From the (1.9) is obtained:

$$p_s - \frac{\Delta c_s(s,h)}{\Delta s} = 0 \qquad (1.10)$$

$$-\frac{\Delta c_s(h,s)}{\Delta h} - t = 0 \qquad (1.11)$$

The idea behind this type of tax is that the polluter firm should pay a tax, leading the costs of the firm at the right level - too low in the absence of this tax. Direct consequence of the introduction of such tax will be a decrease in the quantity produced, which tends toward the efficient quantity. Following the idea depicted in Figure 1.1, the Pigouvian tax is a solution for the case in which h°>0.

Figure 1.3 The optimality-restoring Pigouvian tax



Source: Author's elaboration on Mas-Colell *et al.* (1995)

A Pigouvian tax t_h can also be levied on consumers per unit of *h*. Following the previous representation, the tax can be written as:

$$t_h = -\phi_2'(h°) > 0 \qquad (1.12)$$

As a result, Consumer 1 will choose the level of *h* based on the following maximization:

$$\max_{h\geq 0} \quad \phi_1(h) - t_h h \qquad (1.13)$$

The case described above will be examined in the Chapter 5 of this work. In this empirical application t_h is represented by a tourism tax paid by tourists for producing negative externalities in tourist destinations.

The principle of a positive externality is the same, but in this case:

$$t_h = -\phi_2'(h°) < 0 \quad (1.14)$$

Namely it takes the form of a per-unit subsidy, meaning that the Consumer 1 receives a payment for each unit of the externality generated.

After the first introduction by Pigou, economist have generally accepted that when externalities are present, indirect taxation can be used as a tool for correcting inefficiencies in the competitive allocation of resources (Sandmo, 1975, p. 86). The application of this typology of taxation is appropriate when the externality is linked to a public good, situation in which negotiations between the parties are not possible. The tax effect, in this case, reflects the damage (or benefit in case of positive externalities and then subsides) generated by the production or the consumption of the public good and inflicted on other individuals. The most cited public good in the literature is the natural environment. His protection and policies related to environmental externalities are very common issues in the economic literature.

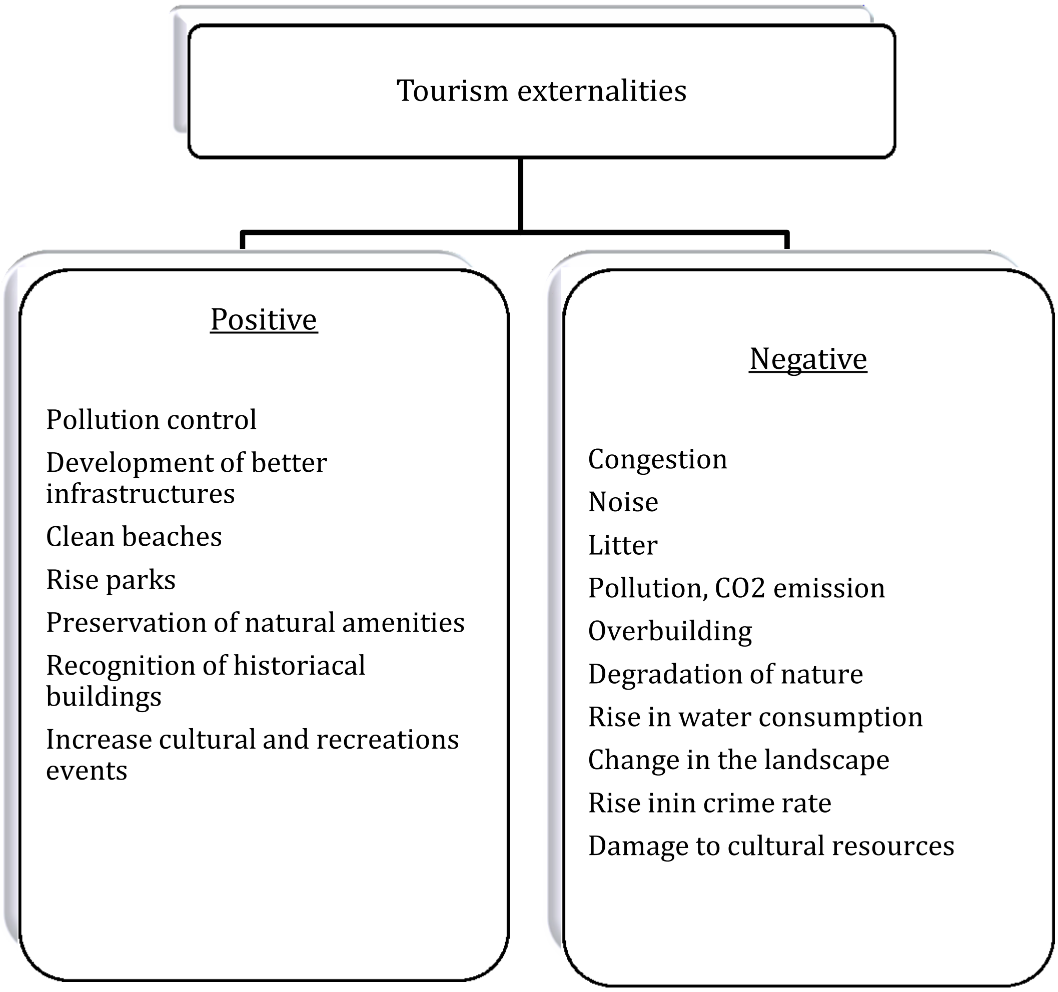
Baumol and Oates (1988) list some pervasive externalities problems in which the number of individuals involved is sufficiently large to make negotiations impracticable (*i.e.* disposal of toxic wastes; sulfur dioxide, particulates, and other contaminants of the atmosphere; various degradable and no degradable wastes that pollute the world's waterways; pesticides, which, through various routes, become imbedded in food products; deterioration of neighborhoods into slums; congestion along urban highways; high noise level in metropolitan areas; p. 12).

The same kind of idea is the basis of emission taxes, namely a tax that one has to pay to get a license to pollute. Cropper and Oates (1992) argue that emission taxes are more economical and practical than the Pigouvian tax. This is true when one does not have access to a lot of information on pollution levels, then imposing an emission tax might has better results in terms of reducing the level of pollution.

1.3 Tourism externalities

Tourism sector might cause positive or negative impacts on destinations (Figure 1.4). Indeed, tourism growth - in terms of international tourist arrivals[11] - might generate benefits and costs. Specifically, a tourism externality occurs when *"the consumption or production decision of one party unintentionally affects the utility of another consumer or the output revenue and profit of another producer"* (Stabler *et al.* 2010, p. 336-7). The most important point is that the party benefiting from the externality does not pay to the party conferring it, and equally the party suffering from the externality does not receive compensation for this.

Figure 1.4 Positive and negative tourism externalities



Source: Author's elaboration

[11] According to the World Tourism Organization (UNWTO) definition, international tourist arrivals are considered tourist arrivals at frontiers (excluding same-day visitors).

On the one hand, the local economy improves in terms of income and employment, on the other hand problems such as congestion, noise and degradation of nature, could make the quality of life of resident population worse. For this reason it is broadly supported in the literature the fact that tourism activity is associated with positive and negative externalities at the same time.

According to Chang *et al.* (2011) "*economic benefits of tourism are clear (more employment and high tax revenue potential), but it also generates substantial attendant externalities, such as congestion and environmental degradation"* (p. 91). In a recent study Schubert (2009, p. 3-4) makes a long list of externalities associated with tourism. The author distinguishes between externalities that negatively or positively affect the welfare of resident population.

In the first list appear:

"*crowding and congestion of roads, public transportation and cities, and thus conflicts between tourists and residents in using infrastructure, noise, litter, property destruction, pollution, increased water consumption per head, CO2 emissions, changes in community appearance, overbuilding, changes in the landscape and views, degradation of nature, e.g. caused by saturation of construction and development projects, depletion of wildlife, damage to cultural resources, land use loss, increased urbanization, and increased crime rate."*

While in the second one are listed:

"more and better leisure facilities, more beaches designated as parks, greater recognition of the importance of saving historical buildings, development of infrastructure respectively better infrastructure, pollution control, clean beaches, cultural exchange, giving residents a better understanding about the world, increasing wealth of residents, better public health system, and so on."

As stated before, in the economic literature it is well known this double effect of tourism sector. Stabler (1999) argues that an example of negative tourism externality is the beach erosion caused by the overcrowding of customers of a hotel near located. On the contrary, an example of positive externality is the aesthetic improvement of a city and also the quality of life of residents due to a tourist event that requires investments on the urban quality and organization of new cultural and recreational events (Candela, 1996). However, the impact generated by tourists depends on both the volume and the profile characteristics of tourists, such as the length of stay, activity, mode of transport and so on (Archer *et al.* 2005, p. 80). Indeed, Candela *et al.* (2008) argue that tourism externalities can be defined as *"multiple externalities"* because externalities caused by tourism can change from positive to negative conditional on the level of tourism.

As pointed out in the section 1.2, in general externalities can be categorized as consumer on consumer, producer on consumer, producer on producer and finally, consumer on producer. In this section the attention is focused on these four typologies associated with tourism. According to Stabler *et al.* (2010), externalities linked to tourist as consumers, take place during peak times in particular in the airports. Indeed, as a consequence of the large number of passengers, check-in times are longer. In addition, many destinations offering different experience (for instance cultural, gastronomic and seaside tourism) can experiment conflict between different groups of tourists and different behaviors.

Producer on consumer tourist externalities are common in tourist destinations where industrial and commercial activities produce high level of pollution and environmental degradation that have negative impact on tourists. Another example can be the so called by Stabler *et al.* (2010, p. 338) "visual intrusion" meaning the proliferation of hotels, facilities, caravan parks etc. in historic and cultural site. In this case both residents and tourists suffer detrimental effects. Producers on other producers also generate similar effects, such as for instance negative consequences derived by noise, congestion, crime, pressure on local services etc. Finally, the last typology includes congestion, air and water pollution that could affect productive activities in the tourism sector.

According to the recent literature review summarized by Meleddu (2013), it is largely sustained in the literature that tourism externalities can be divided into three basic categories: economic, environmental and sociocultural (see also Pearce, 1989; Lindberg and Johnson, 1997). In the first one are included economic effects that tourism causes on the resident population, such as improvement in local economies increasing income, employment and infrastructure level, but also increasing prices of good and services. In the second category are contained environmental effects such as improvement on natural and artificial habitat, but also increment on pollution and so on. In the third one, are enclosed externalities that affect - positively or negatively - the quality of life of resident population (Table 1.1).

Next section extensively analyzes the examples presented in Table 1.1 along with findings of empirical research.

Table 1.1 Tourism externalities on residents in the literature

	Positive	*Negative*
Economic	• Improve local economy and increase employment (Liu and Var, 1986; Milman and Pizam, 1988; Ross, 1992; Akis *et al.*, 1996); • Increased income levels and standard of living (Liu and Var, 1986; Milman and Pizam, 1988; Akis *et al.*, 1996, Tosun, 2002); • Improve investments, infrastructure expenditure, public transport (Milman and Pizam, 1988; Williams and Lawson, 2001); • Improved tax revenues (Milman and Pizam, 1988; Haralambopoulos and Pizam, 1996); • Increases shopping occasions (Liu and Var, 1986)	• Increase in price and shortage of good and services (Milman and Pizam, 1988; Ross, 1992); • Increase price of land and housing (Liu and Var, 1986; Ross, 1992)
Environmental	• Preservation of the natural environment in order to not cause decline (Liu and Var, 1986); • Improved park opportunities (Perdue *et al.*, 1990); • Conservation and protection of both natural habitat and artificial habitat (Norton and Roper-Lindsay, 1992)	• Increase air pollution, water pollution, noise pollution and litter (Andereck *et al.*, 2005); • Disruption of natural habitat and large buildings which destroy views (Andereck *et al.*, 2005); • Congestion and overcrowding (Liu and Var, 1986)
Sociocultural	• Improve quality of life protection (Milman and Pizam, 1988); • Increase recreation opportunities (Liu and Var, 1986; Ross, 1992); • Preserve cultural identity of host population and increase demand for cultural events (Liu and Var, 1986); • Preservation of historic buildings and monuments (Allen *et al.*, 1988) • Encourage cultural exchange (Liu and Var, 1986; Milman and Pizam, 1988)	• Increase crime, prostitution, gambling, alcohol and drugs (Ap, 1992; Upchurch and Teivane, 2000; Biagi and Detotto, 2014)

Source: Meleddu (2014)

1.4 Tourism externalities: findings of empirical research

In the previous section tourism externalities are analyzed from a theoretical point of view. The present section focuses on empirical research and results that have been found in the existing literature.

As presented in the Table 1.1 tourism generates positive and negative externalities on tourist destinations and resident population. Two strands of research exist: the first one examines perceptions of residents in a tourist destination; while the second, more limited, applies econometric models in order to analyze and measure the effects generated by tourism sector on socioeconomic and environmental variables.

In the first group, the most cited article is by Haralambopoulos and Pizam (1996) and concerns the perception of residents in Pythagorion, a tourism destination on the Greek island of Samos. This paper is based on interviews and the only result found is a list of tourism impacts that affect the city, including crime and prices increase and improvement of tax revenues. Such kind of descriptive analysis is common in literature and several papers, based on surveys of a random sample from the total population, highlight the presence of both negative and positive tourist externalities. For example, Liu and Var (1986) propose 636 questionnaires to residents of Oahu, Hawaii, Maui, and Kauai in 1982 and find that residents benefit by tourism in term of local economy and quality of life improvement and employment and income levels increase. Similar results find Milman and Pizam (1988) analyzing a sample of 203 Central Florida households*;* Ross (1992) interviewing 508 residents of the Australian tourist city of Cairns; Akis *et al.* (1996) for the case of Cyprus and Tosun (2002) studying resident perceptions of tourism impacts on a Turkish town. But, at the same time, tourism generate negative impact, such as for example increase price of land and housing (Liu and Var, 1986)[12].

However, analyzing the impact of tourism without a formal quantitative approach does not allow one to suggest any solution to the problem, but only gives first hints that some effect exists.

As mentioned above, despite the importance of the issue there are not a wide strand of research that study the impact of tourism in order to numerically quantify this effect. Some attempts have been provided and econometric techniques have been used in recent years to analyze this topic, among others,

[12] Liu and Var (1986) find a long list of tourism externalities. Among these, positive are: increase shopping occasions, preservation of the natural environment, increase recreation opportunities, preservation of cultural identity of host population and at the same time increase the demand for cultural events and encourage cultural exchange; while negative are: the congestion and overcrowding in tourist destinations.

Contingent Valuation (CV), cointegration analysis, Generalized Method of Moment (GMM henceforth), Structural Equation Models (SEM). Therefore, excluding descriptive analysis (first group), from an empirical perspective quantitative applications are rather heterogeneous (second group).

The review of empirical results shows that main negative externalities include:

1) increase of crime rates (McPheters and Stronge, 1974; Montolio and Planells, 2013; Biagi and Detotto 2014);
2) destruction of environment and natural amenities (Lindberg and Johnson, 1997; Taylor *et al.,* 2005);
3) Dutch disease (Capò *et al.*, 2007; Chang *et al.,* 2011).

While positive externalities are synthesized into the concept of *tourism led growth hypothesis* (Balaguer and Cantavella-Jordà, 2002; Dritsakis, 2004; Louca, 2006; Nowak *et al.*, 2007; Brida *et al.* 2008, 2009, 2010; Proença and Soukiazis, 2008; Cortés-Jimenez and Pulina, 2010; Seetanah, 2011; Bimonte *et al.* 2012).

Regarding increase of crime rates, the first finding is by McPheters and Stronge (1974). They find that a one per cent increase in tourism generate an increase of crime offences equal to 0.03% in Miami. Jud, for the case of Mexico, show a percentage of 0.34. More recently, Montolio and Planells (2013) studying Spanish case, highlight a 0.11% for serious crimes against the person and 0.35% for serious crime property related. Biagi and Detotto (2014) show the elasticity equal to 0.22%, in a cross section analysis on Italian data.

The contingent valuation method is used by Lindberg and Johnson (1997) in order to compute the willingness to pay (WTP) of residents in Oregon (USA) to reduce tourism-related traffic congestion. The author finds that - on average - every household has a WTP between 110 and 186 dollars. More recently, Taylor *et al.* (2005) investigate the WTP for environmental quality in the Croatian island of Hvar. The authors examined the potential implications of using tourist eco-taxes[13]; they consider the quality of the environment, quality of life of residents and tourist welfare as central attributes of sustainable tourism and find that the WTP for environmental protection is higher (0.65€ per day) than the proposed tax.

The so-called *Dutch disease* originates the name by the sharp increase in wealth in Holland in the '60s due to the discovery of large reserve of gas[14], fact that produced a strong currency appreciation and negative effects on the manufacturing sector. Since then, this name identifies several negative effects caused by the development of natural resources and the consequent shift in demand. In the tourism sector, these symptoms are associated whit the

[13] Tourist eco-taxes are defined as being those that are raised on tourists for environmental purposes. International experiences with tourist eco-taxes are represented by Balearic Island in Spain, Bhutan in Asia, Dominica in the Caribbean Sea.

[14] The name was used for the first time in The Economist on 26 November 1977.

exploitation of beaches and natural areas in general. Capò *et al.* (2007), studying two cases of Spanish tourist destinations, namely the Balearics and Canary Islands, find that the tourism specialization generates increase in service sector and a gradual decrease in industry and agriculture labor. In addition, two regions are become less innovative and less educated in their workforces, whit respect to other Spanish regions. In terms of environment and urban development, it is observed over-construction of infrastructures and second homes and heavy pressure on natural resources. According to the author, all these issues will compromise - in the long run - the economic growth.

In contrast with the *Dutch disease* theory, over the past decade increased the interest for quantitatively considering the impact of tourism on GDP and the role that tourism and tourist-related activities play in the long run growth. A large strand of research has been developed, famous as *tourism led growth hypothesis,* firstly tested by Balaguer and Cantavella-Jordà (2002) for Spain. This seminal work analyses whether tourism activity has affected Spanish economic growth over the period 1975-1997. In this case study authors find that a 5% of a sustained growth rate in foreign exchange earnings from tourism would imply an estimated long run increase of almost 1.5% domestic real income (p. 881). Following Balaguer and Cantavella-Jordà (2002), other scholars seek to investigate this relation between tourism and economic growth. As far as European countries are concerned, it is possible to mention Dritsakis (2004) for Greece (1960-2000); Louca (2006) for Cyprus (1960-2001); Nowak, Sahli and Cortés-Jimenez (2007) for Spain (1960-2003); Proença and Soukiazis (2008) for Greece, Italy, Portugal and Spain (1990-2004); Cortés-Jimenez and Pulina (2010) for Italy and Spain (1954-2000). It is worth to notice that all these studies have in common the evidence that - in the long run - international tourism demand is an important driver for the economic growth and, in addition, the causality is unidirectional (Granger causality). Results are obviously different and depend on the period analyzed and the method used, however elasticities are equal to 0.03 on average for Greece, Italy, Portugal and Spain (Proença and Soukiazis, 2008); 0.06 for Spain (Nowak, Sahli and Cortes, 2007); 0.30 for Spain (Balaguer and Cantavella-Jordà, 2002); 0.31 for Greece (Dritsakis, 2004). According to Bimonte *et al.* (2012), Latin American countries present higher elasticities than European countries. Indeed, in their recent review of the literature, it is shown that Chile presents elasticity equal to 0.82, Mexico 0.70, Colombia and Uruguay 0.51 and 0.42 respectively, with unidirectional causality. These findings, extracted from previous studies by Brida *et al.* (2008, 2009, 2010) and Brida and Risso (2009), confirm the result obtained by Lee and Chang (2008), about the stronger impact of tourism on non-OECD countries.

In summary, tourism externalities are seen as an important issue, starting from first studies in the '70s, but according to Chang *et al.* (2011) "*in the economics literature, there is a lack of a comprehensive theoretical analysis of tourism, and, in particular, the relevant public regulation of tourism and social welfare analysis has not been formally modeled"* (p. 91).

The Chapter 2 is dedicated to the main questions that the present dissertation seeks to solve, in light of the results of the empirical literature. A specific section will be dedicated to illustrate why the case of Italy is suitable for the purpose of the analysis.

CHAPTER II

Tourism externalities: positive or negative effect?
Motivations and key questions

2.1 Introduction

Chapter 1 focused on the definitions and theory of externalities, with particular regard to tourist externalities. Chapter 2 investigates the relations between tourism and positive/negative impact on tourist destinations and resident population, which are central to the present study.

Chapter 2 is divided into 3 main parts. Section 2.2 examines the findings of the empirical research regarding the effects of tourism. In Subsections 2.2.1, 2.2.2 and 2.2.3, sociocultural, economic and environmental externalities are analyzed.

In Section 2.3 are illustrated the research questions and the contributions of the present study. The third main part of Chapter 2 is outlined in Section 2.4 and explains why the empirical application to the case of Italy is suitable for the present dissertation.

2.2 Empirical research and main findings

As mentioned before in Chapter 1, the relation between tourism and externalities that this produces in tourist destinations is becoming relevant due to the fact that tourism has growing overtime. Indeed, tourism sector is able to affect both positively and negatively countries, regions and cities along with their resident population.

Even though Chapter 1 examines tourism externalities in general, this dissertation focuses on three main issues such as: 1) crime/tourism relationship, 2) link between tourism and house prices and 3) tourism taxation as a solution in case of negative environmental externalities.

Therefore, this Chapter analyses the empirical results of the literature regarding three main questions: does a positive relation exist between crime and tourism at provincial level? Does a positive link subsist between tourism and house prices at urban level? And finally, which is the effect on tourist flows of the tourism taxation in a tourist destination?

2.2.1 Sociocultural externalities: the example of crime

As shown in Table 1.1 (Chapter 1), several examples of sociocultural tourism externalities can take place in presence of tourism. They could be both positive and negative, and in general they affect the quality of life of resident population in host communities. One of these is the impact of tourism on criminal activity.

In most cases researches of the four past decades have found that a positive and significant linkage exists between tourism and crime. Such issue has been studied since the '70s when a strand of research has developed and started to empirical analyze this relationship. Initially, very famous tourist destinations was analyzed, such as Miami (McPheters and Stronge, 1974), Hawaii (Fukunaga, 1975; Fuji and Mak, 1980) and Australia (Walmsley *et al.,* 1983); then more recent investigations have been performed also for European cases, such as the two of the most tourist countries in term of international arrivals: Spain (Montolio and Planells, 2013) and Italy (Biagi and Detotto, 2014)[15].

In general, do not exist many papers that quantify the effect of tourism on crime by using econometric models, and those so far published are not without drawbacks. First attempts to study this issue are due to McPheters and Stronge (1974) for the case of Miami, Jud (1975) for Mexico and Fuji and Mak (1980) for the case of Hawaii. These studies find a positive relation between tourism and crime, but only for a single destination, namely Miami and Hawaii, meaning that results are not generalizable. In particular, McPheters and Stronge (1974) state "*The results indicate that major economic crimes (robbery, larceny, burglary) have a similar season to tourism, while auto theft and crimes of passion (murder, rape and assault) have not. The overall relationship between the seasons in crime and tourism is significant, and this appears to reflect significant relationships between tourism and robbery, larceny and burglary"* (p. 290). However, the authors noticed that in the case of Miami during 1963-66 no direct monthly measure of tourism is available, therefore it is used - as a proxy for tourist flows - the number of employee in eating and drinking places.

The seminal work by Jud (1975), even though adds to the previous the fact that more than one country is taken into consideration, it studies the phenomenon only for a cross section, as Pizam (1982) for the case of United States. Nevertheless, the last author finds the opposite result: tourism does not significantly affect crime. This outcome could be due to the aggregation of the data, at national level, that in same case reduces the statistical variability.

Confirmation of the significance of tourism variable is recently given by Montolio and Planells (2013) and Biagi and Detotto (2014), More specifically, the first work analyzes the case of Spain at provincial level for a time span of nine

[15] For a more detailed literature review on tourism/crime relationship see Chapter 3 (Section 3.3) of the present dissertation.

years (2000-2008). While the second study, by Biagi and Detotto (2014), uses Italian provinces, but only for a cross section of provinces. Nevertheless, it is the first attempt to measure the tourism/crime relationship in Italy and, a the same time, the first application of spatial econometrics on this topic, the main limit of the work is that the authors do not consider the dynamic of the relation and the persistence of the crime. Two last features are, on the contrary, taken into consideration by Montolio and Planells (2013).

In conclusion, after having analyzed the literature, as far as the impact on crime is concerned, the presence of externalities generated by tourism activity is confirmed for Italy, but more research is needed on this topic. According to Burnt *et al.* (2000), the phenomenon is not new, but given the growing importance of the tourism, the question becomes relevant in terms of policy implication for the tourist destinations and policy makers.

2.2.2 Economic externalities: the example of house prices

After having introduced an example of sociocultural externality, it is presented another example, but in this case of economic externality. Indeed as highlighted above, tourism generates both negative and positive effect on host communities, and in particular at local level a paramount relation between tourism and economic growth has been studied in the recent literature (Bimonte *et al*., 2012; Paci and Marroccu, 2013; Brida *et al.,* 2014).

House prices and tourism are in some way related. Tourism economics and housing literature are unanimous in recognizing a positive and significant impact of tourism sector on house prices. The main method used to analyze this issue has been the hedonic pricing method, based on micro data (HPM henceforth)[16]. It is applied to explore the effect of location amenities on the price of tourism accommodation such as hotels (Espinet *et al.*, 2003; Hamilton, 2007), holiday cottages rented by firms specialized in tourism accommodation (Le Goffe, 2000; Taylor and Smith, 2000; Vanslembrouck *et al.*, 2005; Fleischer and Tchetchik, 2005; Nelson, 2009), and coastal single–family houses and small condominiums (Pompe and Rinehart, 1995; Rush and Bruggink, 2000; Conroy and Milosh, 2009)[17]. Each case study in this strand of literature is very specific-oriented, while applications on the effect of tourism sector as a whole on the house prices are very

[16] The HPM was developed by Rosen in 1974 and is based on the consumer theory of Lancaster (1966) and Freeman (1979). It is used to estimate the value of a non-market characteristic of goods and services in order to determine the relation between some attributes of the good and its price. In Chapter 4 (Subsection 4.3.1) of this dissertation will be presented a full description of this method.
[17] A detailed review of the literature on HPM is presented in Subsection 4.3.1 of the present dissertation.

limited. Furthermore, a limit of the application of HPM is the fact that analyses are based on cross sectional data, rather than on panel[18] or time series.

A second method employed in order to identify the determinants of the houses demand is the so-called *inverted demand approach.* In general, these studies are based on the economic and demographic factors affecting house prices and do not take into consideration any amenities effect nor tourism market (Mankiw and Weil, 1989; Muellbauer and Murphy, 1997; Tsastaronis and Zhu, 2004; Stevenson, 2008). Only few works seek to control for fixed effect at city level. According to Capello (2002) in Italy "*urban dynamics differ considerably across cities, and structural characteristics of local economies play an important role in urban pattern"*(p. 605-6)[19]. As it is pointed out before, place-related amenities and tourist variables are often not included in the empirical applications due to their focusing on other economic variables, such as for instance income per capita, mortgage rates (*i.e.* interest rates on loans to private households for house purchases), refinancing rates (*i.e.* interest rates on loans to non- financial firms) and construction costs (Kjuth, 2010).

As far as Italian case is concerned, recently Cannari and Faiella (2008) conclude their work on house prices and housing wealth asserting: "*higher prices turn out to be correlated with the tourism inclination of regions"* (p. 97). This conclusion derives by a preliminary estimate of house prices on only two regressors, namely population size of the municipality and the share of firms operating in the tourism industry. The result, which is empirically tested for the first time, suggests more investigations, in particular because this analysis is based on cross sectional data (year 2002) for a sample of 1,233 municipalities out of 8,101 Italian municipalities[20]. Secondly, because the model estimated could present the problem of omitted variables due to the fact that traditional variables on housing literature are not included into the estimation.

Biagi *et al.* (2012) confirm that the impact of tourism sector on house prices is significant and positive for the case of Italy. Specifically, they find that in Sardinia, the second main island of Italy, tourism positively affect house prices at municipality level. Nevertheless the simplicity of the analysis, this work represents the first and unique attempt - so far - to measure the impact of tourism on house prices at urban level in Italy. As in the case of Cannari and Faiella (2008) authors employ cross sectional data (year 2001), but other variables are

[18] Econometric analysis considers several steps: first of all to define the set of variables for the model. Data can be classified into three typologies: 1) cross sectional, 2) time series o 3) panel. Cross sectional data are observed in a period of time for several units *(NX1).* Time series data are observations about a single unit for several times *(1XT).* Panel data, known as longitudinal data, are observation on a cross-section over several time periods *(NXT).*

[19] Capello (2002), analyzing 95 Italian provincial capitals, estimates the national time-varying component and then tests whether they are statistically different from zero. The statistical test rejects the null hypothesis at the 1% significance level.

[20] The authors use the *Consulente Immobiliare* database.

included into the regression, such as amenities and disamenities, income and density.

2.2.3 Environmental externalities: tourism taxation as a solution

Following the classification presented in the Table 1.1, another typology of tourism externality is represented by environmental externalities. These can affect destinations in which a large number of visitors are concentrated both spatially and temporally. Archer *et al.* (2005) make some examples: *"marshlands and mangrove swamps, which provide both outlets for flood control and also the basic ingredients for local fishing industries, have been drained to create tourist marinas. Water resources needed by local farmers and villages have been diverted for the use of tourist hotels and golf courses, and, in some mountainous areas, forests have been depleted to create ski slopes with much resultant soil erosion, flooding, and mud slips causing substantial loss of life and damage to property"* (p. 92).

In comparison with two previous typologies of externalities, environmental ones represent a more common case study. Indeed, for its importance OECD (1997) provides a suitable definition: *"Environmental externalities refer to the economic concept of uncompensated environmental effects of production and consumption that affect consumer utility and enterprise cost outside the market mechanism. As a consequence of negative externalities, private costs of production tend to be lower than its "social" cost. It is the aim of the "polluter/user-pays" principle to prompt households and enterprises to internalize externalities in their plans and budgets."*

Taxes are included by Stabler *et al.* (2010) in the list of policy/environmental instruments suitable as a solution of market failure (see Figure 2.1), and it is well known in economic literature that externalities can be internalized by using taxes or subsidies (Schubert, 2009). Public institutions levy taxes for three main reasons: 1) allocate a budget to supply goods and services; 2) redistribute wealth amongst residents; 3) internalize negative externalities (see also Gago *et al.*, 2009)[21]. In presence of market failure, governments may issue taxes to internalize the negative impact exerted by free riders on, amongst others, common resources. This is particularly true for the tourism activity where consumers tend to purchase and make use of environmental resources at the visited destination, without directly contributing to public budget. Since, environment and public services are

[21] According to Gago et al. (2009) "The broad use of tourist taxation can be put down to several reasons:(i) the magnitude of revenue potential (…);(ii) the low distortionary effects of taxation and the exportability of the fiscal burden (…); (iii) the ability to act as a price substitute for the public goods and services consumed by tourists; (iv) the corrective role that could be played by these taxes (…) (p. 381).

two fundamental components of the tourism product, an uncontaminated landscape along with efficient public services is essential to foster both tourism-based economic growth and residents' quality of life - in the short and long run. However, during the tourism season, tourism destinations often struggle to maintain unaltered tourists' experience quality as well as residents' quality of life. Furthermore, many local governments face budget constraints that limit ways to mitigate negative externalities on the environment.

In this context, a government can achieve an internalization of negative externalities either via a subsidy to pursue certain public interest objectives (see e.g. United Nations, 2000; Dixon *et al.*, 2001) or issuing taxes. Specifically, taxes correcting any environmental externality caused by the presence of tourism are called *eco-taxes*[22]. Hence, tourism eco-taxes can be defined as those raised on tourists for improving and protecting the environment. In recent times, the debate to introduce, or reintroduce, tourism taxation in specific destinations has become a relevant and controversial issue. As reported by the UNWTO (1998), while before the 1960's international tourism was effectively free of taxation, currently there are approximately forty different types of taxes issued on the tourism sector in both developed and developing countries. In this perspective, the aim of issuing tourism taxes is to raise more revenues so as to fund environmental preservation, improve public infrastructure and the overall quality of services supplied at a destination. Therefore, on the one hand, local governments support tourist taxation as an instrument to increase revenues from the non-resident population, on the other hand, stakeholders argue on the possible loss of competitiveness caused by its application (Aguilò *et al.*, 2005).

As a consequence a strand of research, starting from the late '70s, has analyzed the effect of the tourism taxation on tourist flows[23]. Based on empirical analyzes, many scholars are convicted that tourist demand is not affected by the tourist taxation (Mak and Nishimura (1979) for the case of Hawaii; Combs and Elledge (1979) for the case of US; Gooroochurn (2004) and Gooroochurn and Sinclair (2005) for the case of Mauritius). This means that in the destinations analysed tourism demand is inelastic. According to Taylor *et al.* (2005) several empirical studies have shown that the demand for tourism is inelastic. This is due to the fact that many destinations have specific -and sometimes unique - characteristics, no clearly substitutable because of their location, attractive natural amenities and historical heritage. Crouch *et al.* (1992) analyzing a sample of forty-four works, calculate the average elasticity equal to -0.39 (a 1% increase in the relative prices would lead to a 0.4% decrease in arrivals); Vanegas and Croes (2000) by using data on American tourist in Aruba, record a very similar result: -0.56 in the short

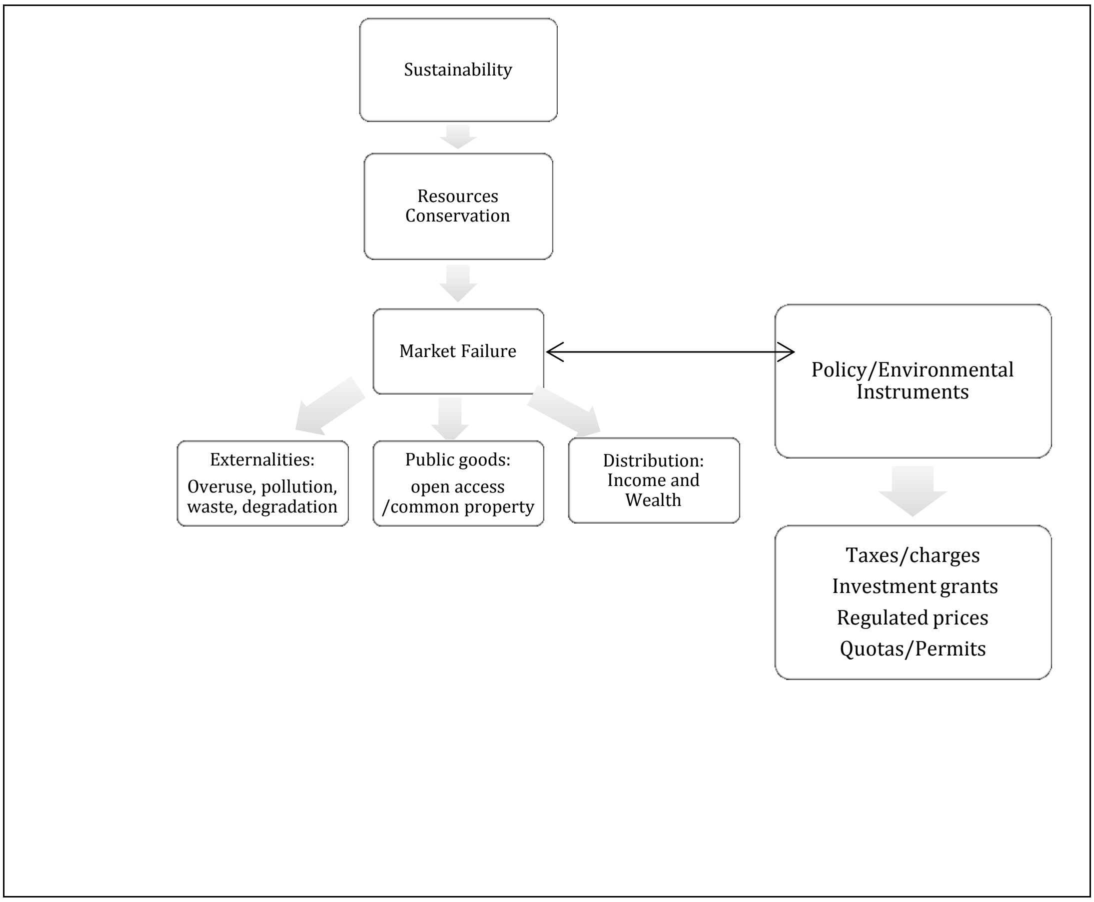
[22] See footnote 13 in Chapter 1 of the present dissertation for a complete definition of eco-tax.
[23] For a more detailed literature review on this topic see Chapter 5 (Section 5.3) of the present dissertation.

run (a 1% increase in the relative prices would lead to a 0.6% decrease in arrivals); Hiemstra and Ismail (1992) show an elasticity equal to -0.44 in the American hotel demand (a 1% increase in the relative prices would lead to a 0.4% decrease in arrivals).

As recently reported by Sheng and Tsui (2009) "*The past literature includes a number of studies on the impact of tourism taxes on destinations' welfare, often with controversial findings*" (p. 627). Indeed, some studies, among which that by Durbarry and Sinclair (2001), highlight that tourism is sensitive to price. In particular in the United Kingdom, tourism taxation generates a decrease of tourist expenditure (elasticity of the demand equal to 1).

The most part of these works is based on the Computable General Equilibrium model (CGE) (see Gooroochurn, 2004; Gooroochurn and Sinclair, 2005; Gago *et al*., 2009). The CGE approach is employed in order to simulate the macroeconomic condition of a country or a region, for a specific year. This represents the main weakness of the above literature, because the effect of taxation on tourist flows can occur after some period of time and not only during one year. In addition, the CGE model requires several data on all markets of an economy, such as for example goods, services, factors etc., often included into the National Accounting Matrix. In the case of Italy, this point is not trivial. Recent laws on tourism taxation, actually, offer to the municipalities the possibility to introduce the taxation. Therefore policy evaluation cannot take into consideration national or regional level, but the more detailed level.

Figure 2.1 Simplified scheme on environmental externalities



Source: Author's elaboration on Sinclair and Stabler (1997)

2.3 Research questions and the contribution of the present study

The analysis of the past empirical literature on tourism externalities highlights the relevance of the topic. The most part of scholars have studied the impact of tourism on destinations basing on US cases, and only recently the attention is also direct to European countries. From this point of view, the lack of empirical analyses for the European cases - and in particular for the main countries in terms of international arrivals, such as France, Spain and Italy - is evident. Therefore, three main questions arise:

1) Does a positive relation exist between crime and tourism in Italy at provincial level?
2) Does a positive link subsist between tourist sector and house prices in Italian cities?
3) Is the effect on tourist flows of the tourism taxation in an Italian tourist destination positive or negative?

To answer of these questions, three empirical analyses are implemented (see Chapters 3, 4 and 5).

The first one is a panel data[24] analysis, implemented with the purpose of empirically test if also in Italy, tourist flows determine a negative externality, namely the increase of total crime, at provincial level (Chapter 3 of the present dissertation). As discussed in the previous section, empirical results are controversial, and the majority of models does not include a panel of regions or provinces into the analysis, but they are country-specific. Furthermore, for the case of Italy, the only attempt to measure this effect is due to a cross section analysis. Consequences and policy implications become important in the Italian tourist destinations, in particular in terms of resources allocation. They could be for example, a major amount of resources to be allocating in police control in specific cities (where tourism records high level of arrivals) and in specific periods of the years (when tourism flows are at maximum level, peak of the season).

The second one (Chapter 4) presents a dynamic panel data analysis, for the case of Italian provincial capitals, in order to investigate the relation between house prices and tourist sector and a possible presence of externality. In the housing literature analyzed above, main drivers of house prices are economic and demographic variables, and completely omits the tourism factor among the explanatory variables. In HPM, housing characteristics and location amenities mainly affect house prices, but in this case the analyses are very specific and results are not generalizable. On the contrary, in the present dissertation it is central to include the role of tourism as a whole, because of the tourist specialization of Italian country. Therefore, the tourism activity is measured through a composite index as in Biagi *et al.* (2012). In addition, the work takes into consideration the more detailed territorial level, namely the cities level. The relevance of this issue strongly coincides with the local development of urban areas. Indeed, for policy makers is essential knowing if house prices increase as a consequence of a tourism increment, and if resident population could take some advantages on it.

Finally, after having analyzed two different typologies of tourism externalities, the study focuses on a possible solution for environmental externalities: the taxation topic. Indeed, as it is described in Figure 2.1, environmental externalities are a feature of market failure, along with public goods and distribution. According to Stabler *et al.* (2010) there is not an extensive environmental literature of case studies that have evaluated the effects of tourism development on natural resources (p. 335). In this contest, the present work analyzes a case

[24] Panel refers to a pooling of observation on a cross-section of households, countries, firms etc. over several time periods (Baltagi, 2014).

study on a specific municipality in Sardinia, Villasimius in the South part of the island (Chapter 5). There, in order to find the solution of environmental externalities problem, the municipality administration introduced in 2008 a tourism tax on tourists that stay one or more nights in an official tourist accommodation. In Europe, several examples exist of taxation imposed to correct for externalities associated with tourism, such as in the Balearic Islands, Catalonia region and France, to mention a few[25]. In the world, the most famous destination in which is imposed a tourist tax is Maldives. Local government imposes a tax equal to 10 USD to every tourist night that tourists spend in the Maldives. As a result, tourism tax revenue is a significant financial asset to their economy (McAleer *et al.*, 2005). Gooroochurn and Sinclair (2005) describe more than forty different types of tourist taxation in developed and developing countries and UNWTO (1998) records that fiscal revenues generated by tourism are on average 10-25 per cent of total revenues. In particular, in small and highly specialized countries such as Maldives and Bahamas this share can reach 40 or 50 per cent.

In the case of Sardinian municipality of Villasimius, the aim of the present study is to evaluate whether such policy has generate a decrease in terms of tourist flows after this implementation.

2.4 The case study: tourism externalities in Italy

To investigate on this specific subject, Italy represents a useful case study for many reasons.

First, Italy is a tourist country. As mentioned in the introduction of the present work, Italy ranks fifth in the rankings of the most visited countries in the world (UNWTO, 2014)[26]. If total tourist arrivals[27] are considered, the position of Italy is third in the area EU-28, after France and Germany[28]. Italy remains third as far as nights of stay are concerned, after France and Spain[29]. According to recent analysis, the direct contribution of Travel & Tourism to GDP in Italy in 2012 was approximately sixty-three billion euros (4.1% of GDP; WTTC, 2013); considering

[25] In Chapter 5 a specific Section (5.4) will focus on the analysis of tourist taxation application in European countries.

[26] UNWTO data record only international tourist arrivals, while EUROSTAT provides more detailed yearly statistics, such as total tourist arrivals and total nights of stays, for 28 European countries.

[27] Tourist arrivals are the number of visitors (domestic and international) registered in official tourist accommodation; tourist nights of stay (or overnights stay) are the total number of nights spent by visitors in official tourist accommodation (ISTAT).

[28] Total tourist arrivals in 2013 are recorded to be 151,089,055 in France, 149,395,295 in Germany and 103,848,321 in Italy (EUROSTAT, 2014).

[29] Total tourist nights of stay in 2013 are recorded to be 403,577,275 in France, 389,211,987 in Spain and 376,709,081 in Italy.

also the indirect and induced effects, this amount increases to 161 billion (10.3% of GDP). According to the National Institute of Statistics (ISTAT henceforth) in 2012, Italy recorded three hundred and eighty-one million nights of stay (domestic and international tourists; ISTAT, 2013)[30]. This indicator is very important because it measures the length of visitors' stays and represents a further proxy of the impact of tourism on the economy as a whole. As reported by ISTAT, the number of tourists in Italy has constantly increased (Table 2.1): 27 million arrivals were counted in the official tourist accommodation[31] in 1962, while they reached approximately 104 million in 2012. Even if nights of stay is the most commonly used indicator of tourism demand, as it represents the ability to hold visitors in a tourist destination, tourist arrivals is used as proxy for the capacity to attract people.

Table 2.1 Evolution of tourist arrivals and nights of stay in Italy. Years 1962, 72, 82, 92, 2002, 2012

Years	Arrivals	% Var	Nights of stay	% Var	Nights of stay/population
1962	27,527,000	-	161,042,000	-	3.18
1972	40,084,000	4.56%	264,842,000	6.45%	4.89
1982	54,073,316	3.49%	339,800,166	2.83%	6.01
1992	59,896,946	1.08%	257,363,468	-2.43%	4.53
2002	82,030,312	3.70%	345,247,050	3.41%	6.06
2012	103,733,157	2.65%	380,711,483	1.03%	6.41

Source: Author's elaborations on ISTAT data

A large number of businesses participate in the provision (supply) of the 'tourist product' – from hotels and recreation to catering businesses and transport services. In providing tourism statistics, ISTAT delivers information about the number of businesses operating in the formal tourist accommodation sector in Italy[32] as well as the number of tourists that choose each type of accommodation

[30] ISTAT collects tourism statistics on "occupancy in collective establishments" and "capacity of collective accommodation establishment" (demand and supply side respectively). As far as demand side is concerned, arrivals and nights of stay, collected since 1957, are divided into Italian and international tourists, and are divided into every type of accommodation establishment (hotels and similar and other collective accommodation establishments). The last available data, regarding 2012, is 103,733,157 arrivals and 380,711,483 nights of stay (foreign component counts 47% of total) (www.dati.istat.it).

[31] ISTAT distinguishes official tourist accommodation between *"hotels and similar accommodation"* and *"other collective accommodation"*. In the first typology are included hotels classified into five categories and hotel-tourism residences; while in the second typology are included tourist campsites, holiday villages, tourist campsites and holiday villages-mixed forms, holiday dwellings (rented), farmhouses, youth hostels, holidays homes, mountain refuges, other accommodation, bed and breakfast and other private accommodations) (www.dati.istat.it).

[32] According to the latest available data from ISTAT, in 2012 Italy counts 157,228 collective accommodation establishments in total, divided into 33,728 hotels and similar and 123,500 other accommodations.

and duration of stay (demand). In Table 2.2 is presented the evolution of tourist accommodation in Italy. Although tourist statistics have been collected by ISTAT since 1957, only the number of hotels is available starting to this year, while campsites are available from 1972 and other accommodation from 1989. The trend of the Italian supply of total tourist accommodation is positive, with a peak on the '90s. In particular, this increase is due to a rise in other tourist accommodation, while at the same time, hotels recorded a decrease.

Table 2.2 Evolution of tourist accommodation in Italy.
Years 1962, 72, 82, 92, 2002, 2012

	Hotels	% Var	Campsites	% Var	Others	% Var	Total	% Var
1962	34,798	-	N.A.	-	N.A.	-	34,798	-
1972	42,289	22%	1,231	-	N.A.	-	43,520	25%
1982	41,160	-3%	1,863	51%	N.A.	-	43,023	-1%
1992	35,371	-14%	2,299	23%	18,551	-	53,922	25%
2002	33,411	-6%	2,370	3%	80,304	333%	113,715	111%
2012	33,728	1%	2670	13%	123,500	54%	157,228	38%

Source: Author's elaborations on ISTAT data

Second, at urban level Italy presents different features that cluster groups of cities such as: art cities (e.g. Rome, Venice and Florence among others); seaside destinations (e.g. Rimini, Ravenna, and Naples); environmental specific and unique amenities (e.g. Belluno and Bozen (Dolomites), Brindisi (Salento) and Palermo (Etna and *Isola delle Femmine* Natural Parks); religious sites (Perugia and Padua). This heterogeneity is crucial in determining the flows of different tourists, because it is well known fact that factors supply, such as cultural, historical and natural amenities, directly influence tourist flows. Furthermore, according to Paci and Marrocu (2013) *"tourists have different expenditure potential, preferences and interests, and it is important for managers in the destination to differentiate among them"* (p. 2).

This phenomenon of geographical and socioeconomic variations at city level could generate different effects of tourism and, as a consequence, different kind of externalities. A recent study by Marrocu and Paci (2013) examines the tourist flows determinants in Italian provinces. They find that the main destination attractiveness is given by well preserved beaches, follow the presence of costal areas, renowned restaurants, accessibility and, finally, the presence of parks and museums. For this reason tourist flows in Italian cities have different levels of development and contribute in different terms to local costs and benefits.

Third, only few previous studies have applied the Italian case to check tourism externalities at urban level. Biagi and Detotto (2014) for the case of crime, find empirical evidence on positive relation between crime offences and tourist arrivals at provincial level. They, however, analyze only a cross section for the year 2005.

As far as house price is concerned, some attempts have been done. Cannari and Faiella (2008) regressing house prices on demographic and tourist variables, show for the first time the positive relation in a sample of Italian municipalities, but only for the year 2002. Biagi *et al.* (2012) analyzing the case of a cross section of Sardinian municipalities find the same result for the year 2001. These works present the same limitation. Authors seek to explain the relationship between tourism and house prices by using only a cross sectional dataset for one region or a sample of cities and do not examine panel data nor dynamic relations.

Tourism taxation is not a new topic in Italy and in Europe in general. Notwithstanding, policy evaluation about the application and the distortive effect of the tax is not common in the economic literature. Recently, Italy has reintroduced tourism taxation and some empirical researches have been carried out (Perelli *et al.*, 2011; Biagi *et al.* 2013). The key issue is that tourist perception on the tourist tax seems to be not significant in the choice of the tourist destination. However previous analyses are mainly descriptive, hence further developments are needed, in particular in the context of policy evaluation.

The fourth and last reason why Italy is a useful case study is the availability of data. Three case studies analyzed have three different dataset. In the first case, tourism and crime time series are easily downloaded from ISTAT website or from books called "Annuario Statistico Italiano". The second analysis employs data from ISTAT and from "Annuario Immobiliare (by Tamborrino and Tamborrino) at city level. While the third more specific policy evaluation exercise, makes use of regional monthly data about Sardinian municipalities. The reason of data availability is not marginal in applied econometrics as is well known problem among scholars.

CHAPTER III

Relation between tourism and crime: the Italian case

3.1 Introduction

Does tourism encourage criminal activity? If it does, how this occurs? And what activities are encouraged? This chapter studies a possible source of externality, which can occur when criminal activity is stimulated by the presence of tourists.

Since Italy is a country with high level of tourism (see Chapter 2, Section 2.4), in this case tourism not only imposes a social cost on residents, but also generates a detrimental effect on the tourism market as a whole, negatively affecting potential tourism demand. The aim of this analysis is to investigate whether and to what extent, *ceteris paribus*, in Italy tourist areas tend to have a greater amount of crime than non-tourist ones in the short and long run. Following the seminal works of Becker[33] (*Crime and Punishment: An Economic Approach*, 1968) and Ehrlich (*Participation in Illegitimate Activities: A Theoretical and Empirical Investigation*, 1973), the present work investigates a panel of 95 Italian provinces over the time span 1985-2003. It is necessary to specify that in Italy the number of provinces has changed overtime: from 1974 until 1992 the national territory was divided into 95 provinces, which become 103 in 1992 and 107 in 2006. To have a balanced panel[34], the study considers the classification at 95[35].

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[33] Gary S. Becker won the Nobel Prize in Economic Sciences in 1992 *"for having extended the domain of microeconomic analysis to a wide range of human behavior and interaction, including non-market behavior"* (www.nobelprize.org).

[34] The term "balanced panel" refers to a dataset of observation with the number of individuals (N) is the same over the entire sample period (T). As a consequence the total number of observations is easily computed as NXT. This is not true if the panel is "unbalanced", in other words when some individuals are not observed over the entire sample period.

[35] The 95 provinces are: Agrigento, Alessandria, Ancona, Aosta, Arezzo, Ascoli Piceno, Asti, Avellino, Bari, Belluno, Benevento, Bergamo, Bologna, Bozen, Brescia, Brindisi, Cagliari, Caltanissetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Como, Cosenza, Cremona, Cuneo, Enna, Ferrara, Florance, Foggia, Forlì-Cesena, Frosinone, Genoa, Gorizia, Grosseto, Imperia, Isernia, L'Aquila, La Spezia, Latina, Lecce, Livorno, Lucca, Macerata, Mantova, Massa Carrara, Matera, Messina, Milan, Modena, Naples, Novara, Nuoro, Oristano, Padua, Palermo, Parma, Pavia, Perugia, Pesaro-Urbino, Pescara, Piacenza, Pisa, Pistoia, Pordenone, Potenza, Ragusa, Ravenna, Reggio Calabria, Reggio Emilia, Rieti, Rome, Rovigo, Salerno, Sassari, Savona, Siena, Siracusa, Sondrio, Taranto, Teramo, Terni, Turin, Trapani, Trento, Treviso, Trieste, Udine, Varese, Venice, Vercelli, Verona, Vicenza and Viterbo.

The analysis is developed in two steps: in the first step a static panel and in the second step a dynamic model are considered. A series of robustness test are performed, in order to check for possible presence of endogeneity of the explanatory variables included in the model. Indeed, in case of endogeneity, variables are not perfectly independent from the phenomenon under analysis and, consequently, a suitable technique has to be used. Since literature and previous empirical results confirm the presence of persistence over time in crime time series, and endogeneity is suspected, the dynamic model called Generalized Method of Moment (GMM) is the suitable model to be estimated.

The presence of a connection between tourism and crime does not clarify whether the victims are tourists or residents, but it only indicates the presence of a link between tourism and crime as a potential source of negative externalities. Knowing which group of people is more affected may give essential information to better quantify the externality and to identify possible solutions. For instance, criminal activity that mainly targets tourists would impact on the image of a tourist destination as a whole, decreasing its future tourism demand. On the contrary, if the crime is largely committed against residents, the externality affects the quality of life of locals. Unfortunately, due to the scarce availability of crime data worldwide, this analysis is not often undertaken and the few papers available use descriptive statistics (e.g. the case of Hawaii analyzed by Chesnay-Lind and Lind, 1986; the case of Barbados studied by de Albuquerque and McElroy, 1999). Since data on the victimization rate of visitors and residents are not provided by ISTAT it is only possible estimate the model in a third step by using the level of total crime instead of the rate, and controlling for population, size of the province and equivalent tourists (i.e. the number of tourist per day in the destinations). Although the effect of tourism on crime is confirmed, results cannot be interpreted unequivocally and depend on the propensity to report and to be victimized of the two sub-groups (data not available, as explained above).

The present chapter has the following structure: in the second section is constructed a model of crime as tourism externalities that will serve at the basis for the following empirical analysis. In section three a literature review on the relation between tourism and crime (3.3) is shown, while in the section four is presented a descriptive analysis of the development of tourism and crime in Italy (3.4). Section five focuses on the panel data framework (3.5); section six on data and empirical model (3.6); seven and eight describe main results and summarize some concluding comments (3.7 and 3.8).

3.2 The externality of tourism on criminal activity

In order to better introduce the issue of the present work, in this section it is presented a model able to clarify the mechanism underlying tourism externality on crime. Following Baumol and Oates (1988) the notation for the case under analysis includes:

x_{ij} = the amount of tourist good *i* consumed by individual *j,* for (i=1,…, n) and (j=1,…, m)
r_i = the total quantity of resource *i* available to the community
c_k = the production of externality (crime) due to the presence of individual *k*
$z = \Sigma c_k$ = total crime in the community
$u^j(x_{1j}, \ldots, x_{nj}, z)$ = individual *j*'s utility function

Here the variable z in the utility function of individual j represents the possibility that the utility of residents in the destination d is affected by the total crime in the community. Since in economic literature it is well known that criminals respond to incentives, in the case of tourist destinations the presence of a large number of tourists plays the key role. As a consequence, the larger the number of tourists in the destination, the greater the total crime in the area is.

In this context, the resident *j* welfare is affected by the presence of the tourist *k* representing an incentive to criminal activities. In other words, the negative externality of consumption is the result of the so-called *Unfriendly Tourist Hypothesis* (Candela and Figini, 2012; p. 532). According to Candela and Figini (2012) when tourists produce negative externalities, nights of stay *(N)* not only generate a net private benefit *B(N),* but also have a negative social effect on the utility of residents. In monetary terms this effect is represented by a cost *C(N)*, and the social welfare of the destination *W* can be write as follows:

$$W(N) = B(N) - C(N) \qquad (3.1)$$

In the case depicted above, tourism sector decides the optimal amount of *N* on the basis of its *B(N)* without taking into account the social cost for the community. On the contrary, the community evaluates the optimal quantity of *(N)* by estimating the maximum of function (3.2):

$$W'(N^*) = 0 \quad if \quad B'(N^*) = C'(N^*) \qquad (3.2)$$

Therefore, in this case there is a market failure: the number of tourists is higher than what would be optimal for the community.

3.3 Literature review

In the '70s and '80s a strand of research that studies the relation between tourism and crime has developed. In that period the most part of research focuses on the case studies of both famous tourist destinations - such as Miami (McPheters and Stronge, 1974), Australia (Walmsley *et al.* 1983) and Hawaii islands (Fukunaga, 1975; Fuji and Mak 1980) - and not famous such as Tonga in Polynesia (Urbanowlcz, 1977). This topic still maintains its interest. The effect - positive and statistically significant - of tourism on crime is confirmed by recent studies in Spain and in Italy (see respectively Montolio and Planells, 2013; Biagi and Detotto, 2014).

Table 3.1 summarizes main reviewed contributions of the economic literature to date, along with the most salient results.

Table 3.1 Recent studies on crime/tourism relationship

Authors, year of publication	*Case study*	*Typology of analysis*	*Effect*
McPheters and Stronge, 1974	Miami	Time series	Positive
Jud, 1975	Mexico	Cross section	Positive
Fukunaga, 1975	Hawaii	Descriptive	Positive
Urbanowlcz, 1977	Tonga (Polynesia)	Descriptive	Positive
Fuji and Mak, 1980	Hawaii	Time series, cross section	Positive
Pizam, 1982	USA	Cross section	Controversial
Walmsley *et al.*, 1983	Australia	Panel	Positive
Chesney-Lind *et al.*, 1983	Hawaii	Multiple linear regression	Positive
Chesnay-Lind and Lind, 1986	Hawaii	Descriptive	Positive
Ryan, 1993	-	Descriptive	Positive
Kelly, 1993	Queensland	Descriptive	Positive
De Albuquerque and McElroy, 1999	Barbados	Descriptive	Positive
Van Tran and Bridges, 2009	Europe	Panel	Negative
Grinols *et al.*, 2011	USA	Panel	None
Campaniello, 2011	Italy	Panel	Positive
Montolio and Planells, 2013	Spain	Panel GMM	Positive
Biagi and Detotto, 2014	Italy	Spatial lag and spatial error	Positive

Source: Author's elaboration

Fuji and Mak (1980) first studied the reasons why crime increases with the presence of tourism. They find several motivations including the fact that tourists:

1) tend to carry valuable objects and money; 2) tend to be less prudent; 3) are perceived as "safer" targets by criminals because they rarely report crime to the police; 4) alter the local environment, for instance, by generating a reduction of social responsibility for surveillance. Some years later, Chesney-Lind *et al.* (1983) and Chesney-Lind and Lind (1986) quoted the first characteristic mentioned above. They underline that tourists carry valuable objects, such as cameras and jewels, which are the objects that robbers frequently steal. In particular, this typology of crime occurs in the parking near the beach, in the beaches or in the hotels swimming pools. The second characteristic, namely that tourists are less prudent during the holiday, is strongly correlated with the first one, because their victimization is facilitated; this is due to the fact that they tend to frequent some spaces of the city evaluated dangerous by resident population (e.g. disco and bars at late hours). In addition, because tourists stay in the destination just a short period of time, they do not benefit from the local population support. Indeed, it is well known that tourists tend to be isolated from the social support and protection that would have in their city. Chesney-Lind and Lind (1986) define the network including family and friends in the place of residence as "*deterrents to crime and, alternately, their absence increase the risk of victimization"* (Chesney-Lind and Lind, 1986; p. 179).

Ryan (1990) and Kelly (1993) add that in some cases crime is driven by (tourism) demand for illegal goods or services in destinations. In particular, Ryan argues that the types of relationship between crime and tourism can be classified in five groups:

1) most crime is directed against the resident population, and tourists are incidental victims of criminal activity, which is independent of the nature of the tourist destination;
2) crimes are not specifically against tourists, but the venue is used by criminals because of the nature of tourist destination;
3) crimes are committed against tourist because tourists are easy victims, but crime is unorganized;
4) criminal activity becomes organized and is directed against certain types of tourist demand;
5) crime offences are committed by organized criminal and terrorist groups against tourists and tourist facilities.

Furthermore, according to the Routine Activity Theory of Cohen and Felson (1979), crime depends on the opportunities. They affirm "*structural changes in routine activity patterns can influence crime rates by affecting the convergence in space and time of the three minimal elements of direct-contact predatory violations: 1) motivated offenders, 2) suitable targets, and 3) absence of capable guardians against a violation"* (Cohen and Felson, 1979; p. 589). In this contest, the presence of tourists increases the set of available occurrences.

Overall, there are not many studies that explore this topic through the use of econometric models. The assumption is usually that criminals are rational *à la* Becker (1968) and Ehrlich (1973) and respond to incentives. First, Becker sustains that "*a person commits an offence if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities*" (Becker, 1968; p. 9). Therefore, a person becomes offender due to the fact that his benefits and costs are different from those of other persons. As a consequence of this theory, the presence of tourists is seen as a further incentive for illegal activities. Some year later the seminal study of Becker, Ehrlich following the same approach, underlines that in a given period of time, if legal and illegal activities are mutually exclusive, a person have to choose by comparing the expected utility of each activity.

In next subsections are presented empirical studies that analyze this issue at national or specific destination (subsection 3.2.1), in contrast with those studies that use a regional perspective (subsection 3.2.2).

3.3.1 National and case-specific studies

One of the first empirical studies on the relation between tourism and crime is by McPheters and Stronge (1974). They employ a time series in order to investigate whether seasonal crime reacts to seasonal tourism in Miami. The authors find that the tourism-crime relationship is significant and offences, such as robbery, larceny and burglary follow a similar seasonality to tourist flows, while this does not occur in case of auto theft, murder, rape and assault. Total crime is positive and statistically significant, reflecting the significance of robbery, larceny and burglary and confirming initial intuition of authors: tourism generates negative externalities in the destination. However, it is essential highlight that in the analysis above, authors measure the tourism phenomenon through the employment in eating and drinking places, instead of the number of tourist arrivals or nights of stay, which are the most common indicators used today in this sort of analyses. The seasonality of crime is also observed by Walmsley *et al.* (1983), for the case of Australia. As McPheters and Stronge (1974), they notice that peaks in crime statistics correspond to those of tourist activity. They implement a spatial and temporal analysis of the occurrence of crime at selected tourist resorts. By comparing tourist areas and nontourist "control", the authors show significant differences between the two samples in the type of offense and the characteristics of offenders and victims.

Fuji and Mak (1980), studying the case of Hawaii islands both in time series (for the period 1961-75) and in cross section (for the year 1975), reach the same conclusion of McPheters and Stronge: the higher the fraction of tourist in the population the higher the number of robberies and rapes.

Some empirical works exist that do not find the positive relation described so far. In a cross sectional analysis of fifty American states, Pizam (1982) finds a weak relationship between tourism and crime, suggesting that perhaps the relationship is not supported at the national level, while in some communities this can be strongly significant. Actually, in this work Pizam analyzes nine different types of crime and finds that in four of them the relation in positive and significant, confirming that property-related crimes are affected by tourism. More recently, Van Tran and Bridges (2009), controlling for the degree of urbanization, the rate of unemployment, and the spatial position of the each state within Europe (North, South and Mediterranean, Centre and East, West), analyze the relationship between tourist arrivals and crime against persons in forty-six European countries. They find that, on average, an increase in the number of tourists reduces the rate of crime against persons. In this analysis authors employ only the variable murder as measure of crime against person. Therefore, his result is in line with previous works, which underlined a positive and significant effect for crime property-related and a weaker relationship for crime against person (see McPheters and Stronge, 1974; Jud, 1975; Fuji and Mak, 1980). Furthermore, the econometric model used (hierarchical multiple regression) and the employment of only four explanatory variables could represent a problem of omitted variables, such as for example the deterrence, and also a problem of model specification because they do not consider heterogeneity between states.

A very innovative work is by Grinols *et al.* (2011) because they employ for the first time data recorded in National Parks in every county in the US between 1979 and 1998. They, using a panel data on crime and visitors, conclude that for some tourist activity there is no impact on crime, namely national parks visitor do not affect crime. Nevertheless, when a similar analysis is performed it is extremely important to take into account which typology of tourist affects crime. Indeed, although the model in this work seems to be well specified, control variables correctly employed, endogeneity problem taken into account, and the sample size does not suggest any bias, the negative relation between crime and tourism underlined in the results cannot be generalized. This is due to the fact that strongly depends on the type of tourism under investigation.

3.3.2 Regional studies

Another strand of research, more limited to date, takes into consideration groups of regions, provinces or cities that are analyzed in order to determine whether, and to what extent, tourism and crime are related. The first work with similar features is by Jud (1975), which in his seminal work find the same result of Fuji and Mak (1980). He investigates the impact of foreign tourist business on total crime per capita in a cross-section of thirty-two Mexican States for the year

1970 and controlling for urbanization. The study confirms that total crime and property-related crime (fraud, larceny and robbery) are strongly and positively linked to tourism, while crime against persons (assault, murder, rape, abduction and kidnapping) is only marginally linked to it. As in much further analyses, in the work of Jud the study is not able to distinguish between crime committed against foreign tourists and crime committed against resident population. However, it seems to be reasonable think that entire Mexican population is affected by the crimes; as a consequence also in Mexico tourism represents a source of negative externality.

As it is depicted in Table 3.1 in Europe do not exist several case studies and these published are very recent.

Montolio and Planells (2013) analyze data of forty-six Spanish provinces in the time span 2000-2008. The two authors use a very similar panel analysis with respect to that employed in the present chapter (two stage least squares - 2SLS henceforth - and GMM). They consider unobservable characteristics of the provinces, seasonality, endogeneity and the persistence in the dependent variable. Results show that tourist arrivals have a positive and statistically significant impact on the criminal activity for both crime against person and property-related crime.

As far as Italy is concerned, few studies on this topic exist hitherto. The interest seems to be very recent and the only analyses found are the following two: Campaniello (2011) and Biagi and Detotto (2014).

The first one, using a panel approach, explores the case of the 1990 Football World Cup in Italy; the results indicate that hosting the Football World Cup has led to a significant increase in property crimes. In addition, the author remarks that do not exist empirical studies on the negative effect generated by a so big event at the local level, in particular on the criminal activity.

Along the same line of results, Biagi and Detotto (2014), after analyzing eleven types of crime, find a positive relationship between tourism and pick pocketing for a cross section of Italian provinces (for the year 2005). By using a spatial analysis, they investigate whether the incentive to commit a crime change in relation to the typology of tourist destination: coastal, mountain or art cities. In this step, results show a positive effect in art cities, while is negative in mountain destinations.

The purpose of this chapter is twofold. First, to test whether the positive relation between tourism and crime found by Biagi and Detotto (2014) in a cross section for Italian provinces, is persistent over time and can be generalized for total crime, namely crimes against property and against person. Second, to seek to fill the gap of the literature with regard to empirical analysis using panel data. Indeed, as it is clear by the review of the literature, the most part of the works are very case-specific oriented and, consequently, their results cannot be generalizable. On the contrary, the present analysis uses a dataset including all Italian provinces (95) for a period between 1985-2003 and takes into account potential endogeneity along with reverse causality problems.

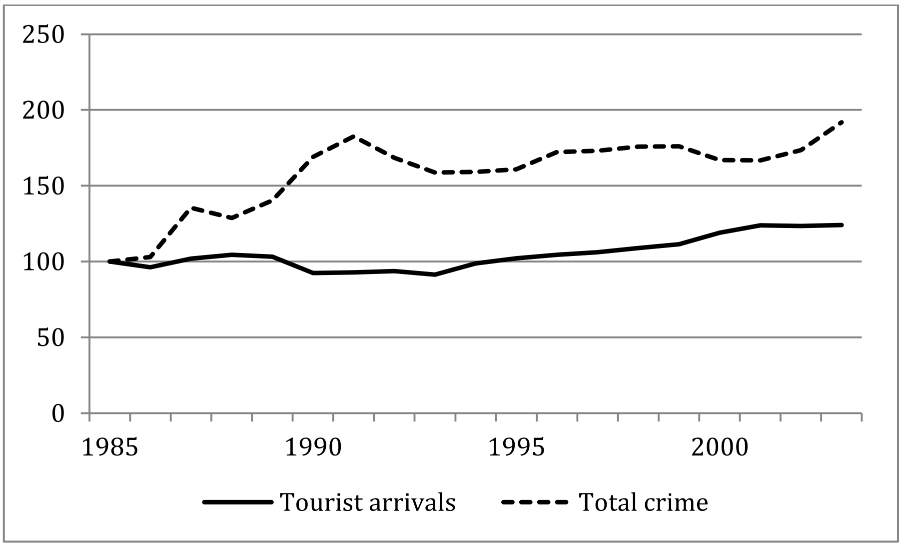
3.4 Description of two phenomena: tourism and crime

Tourism and crime are two relevant phenomena in Italy. Tourism sector in Italy is described in section 2.4 of Chapter 2. As far as crime is concerned, Italy experienced a rather exceptional increase over the last twenty-five years (+35.7%). This trend is in contrast with what occurs during the same time span in many other Western countries such as the US (-20.4%), Canada (-15.8%), the UK (-10.9%), France (-7.5%) and Germany (-6.9%; Eurostat, 2009).

The comparison of tourist arrivals and total crime series[36] for the time span 1985- 2003 highlights a common upward trend of the two variables (Figure 2.1), even if crime increases at a higher pace than tourism. Furthermore, a counter cyclical relationship can be observed between the two series indicating a possible negative correlation among them.

[36] ISTAT data refer to crimes reported to the Judicial Authority by the Police Forces and include: mass murder (art. 422 C.P.); intentional homicides: 1) homicides for theft or robbery, 2) homicides of mafia, 3) terrorist homicides (art. 280 C.P.); attempted homicides; infanticides; manslaughter; unintentional homicides (homicides from road accident); blows; culpable injuries; menaces; kidnappings; offences; rapes; sexual activity with a minor; corruption of a minor; exploitation and abetting prostitution; child pornography and possession of paedo-pornographic materials; thefts (bag-snatching, pickpocketing, burglary, shoplifting, theft from vehicle, theft of art objects, theft of cargo trucks carrying freights, moped theft, motorcycle theft, car theft); robberies (house robbery, bank robbery, post office robbery, shop robbery, street robbery); extortions; swindles and cyber frauds; cybercrime; counteractions of goods and industrial product; intellectual property violations; receiving stolen goods; money laundering; usury; damages; arson (forest arson); damage followed by arson; traffic and drug possession; attacks; criminal association (art. 416 C.P.); mafia criminal association (art. 416/bis C.P.); smuggling; other crimes.

Figure 3.1 Time series of tourist arrivals and total crime offences (base year =1985)



Note: index numbers with a fixed base value 1985=100
Source: Author's elaboration on ISTAT data

In order to better understand the underlying tourism-crime relationship, it is used a simple indicator of territorial statistics: the location quotient (LQ henceforth)[37]. This permits to compute - through a ratio - the territorial specialization with respect to a socio-economic variable. In this case, variables of interest are tourist arrivals and total crime.

The procedure follows three main steps. Firstly, the location quotient (LQ) of tourism ($LQ_{Tourism}$) and crime (LQ_{Crime}) are calculated for each Italian province. LQs allow computing the shares of tourism and crime of each province with respect to the national ones.

$$LQ_{tourism} = \frac{\frac{Total\ arrivals_i}{Total\ arrivals}}{\frac{Surface_i}{Total\ surface}} \tag{3.3}$$

$$LQ_{crime} = \frac{\frac{Total\ crime_i}{Total\ crime}}{\frac{Population_i}{Total\ population}} \tag{3.4}$$

where:
i= 1,2,.., 95 provinces
Total arrivals$_i$ = tourist arrivals in each province in 2003
Total arrivals = tourist arrivals in Italy in 2003

[37] Kelly (1993) employs the same indicator for the same aim in the analysis on the relation between crime and tourism in Australia, mentioned in section 3.3 of the present chapter.

Surface = Area in Km^2 of each province
Total surface = Italian surface in Km^2
Total crime$_i$ = total crime in each province in 2003
Total crime = total crime in Italy in 2003
Popluation$_i$ = inhabitants in each province in 2003
Total population = Italian population in 2003

Secondly, the results of each LQ are divided in quartiles. Finally, the obtained quartiles are matched in order to check whether high levels of tourism correspond to high levels of crime, and vice versa. Table 3.2 shows the cross tabulation of the quartile distribution of the two LQs.

Table 3.2 Distribution of provinces for different levels of tourism and crime

***LQ** Crime* / ***LQ** Tourism*	***LOW (I)***	***MEDIUM (II)***	***MEDIUM-HIGH (III)***	***HIGH (IV)***	***Total***
LOW (I)	**14**	6	3	1	24
MEDIUM (II)	7	**7**	8	2	24
MEDIUM-HIGH (III)	3	7	**9**	5	24
HIGH (IV)	0	4	4	**15**	23
Total	24	24	24	23	95

Source: Author's elaboration on ISTAT data

As one can see on the table above, the first quadrant shows the number of provinces with low level of crime and tourism: 14 provinces. Following the first row of the table one can understand that the number of provinces with low levels of tourism and with medium-high levels of crime becomes smaller (respectively 6, 3 and 1 province). The 58% of total (14/24) displays low level of tourism and crime at the same time. On the last row, on the contrary, there are provinces with high levels of tourism: 15 provinces present high levels of both tourism and crime, while the number of province with high levels of tourism and medium-low levels of crime is small (respectively 4, 4 and 0 provinces). The 65% of total (15/23) displays high levels of tourism and crime at the same time.

The principal diagonal contains the 47% of the Italian provinces, indicating a positive correlation between tourism and crime. The chi-squared test (χ^2 = 45,5) indicates that the *k* groups are dependent.

This descriptive analysis gives a first hint at the relationship between the two phenomena. Crime and tourism seem to move in the same direction: the higher the tourism is the higher the crime is, and vice versa. This relationship needs to be further explored by using appropriate econometric techniques.

3.5 Methodology: using panel data

As outlined in the introduction (see section 3.1), the present analysis employs panel data. A sample is defined "panel" when contains *"observations on a cross-section of household, countries, firms, etc. over several time periods"* (Baltagi, 2014; p. 1)[38].

Therefore, a panel has the following structure:

	1	2	3	...	T
1	y_{11}	y_{12}	y_{13}	$\cdots$	y_{1T}
2	y_{21}	y_{22}	y_{23}	$\cdots$	y_{2T}
	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
N	y_{N1}	y_{N2}	y_{N3}	$\cdots$	y_{NT}

The possibility to work with a very large number of data, with respect to only one cross-section or time series, represents an advantage for economists. In this contest they *"can estimate more realistic and more complicated models"*, because they observe simultaneously more individuals *(i)* over more time periods *(t)* (Verbeek, 2006; p. 307)[39]. Furthermore, the availability of reliable data for cross-section of individuals, countries or firms at different time periods has facilitated the development of panel data estimators. For these two reasons, methods based on panel data have become increasingly popular in the last few decades and are now employed in more and more empirical analyses. In particular, dynamic panel data models (DPD) have gained a leading role in panel data econometrics and is now commonly used in empirical applications both in microeconomic and in macroeconomic. This is due to the fact that this model gives the possibility to study individual dynamics over time.

Several advantages exist by using panel data, and some disadvantages. Arellano (2003), Hsiao (2003), Greene (2003), Wooldridge (2010) and Baltagi (2014) broadly examine the advantages of panel over time series and cross sectional data. To summarize, according to Hsiao (2003) panels have the following benefits:

1) Enable us to control for individuals heterogeneity. The basic ideas is that individuals, countries or other observed units are heterogeneous; on the contrary time series and cross-sectional data are not able to control for this heterogeneity; as a result they risk to produce biased estimations.

[38] There exist two different type of panel: *micro panel,* characterized by a large number of N individuals over a short time T (often are data collected from surveys); *macro panel,* which can have a moderate number of N observed over a long time. For an exhaustive summary and some examples of this two different panel see Baltagi (2014), Chapter 1.

[39] Quotations from Italian texts, when they are not expressed in the original language, are full responsibility of the author.

2) Produce data including more information, more variability, less collinearity among the variables, more degree of freedom and more efficiency. In particular, the variation can be decomposed into variation between states of different characteristics and size (*between*), and variation within states over time (*within*).
3) Allow as to better analyzing the dynamics of adjustment, namely the changes of economic variables over time.
4) Are more appropriate for identifying and measuring effects not measurable through cross-section or time series.
5) Consent to construct and test more complicated models with respect to cross section and time series.
6) On the one hand, *micro panels* can measure phenomena more accurately than at *macro* level, because they reduce bias due to aggregation; on the other hand, *macro panels* can take advantage on information included in long time series.

Baltagi (2014) lists some limitations of using panel data including design and data collection problems, bias due to measurement errors, selection problem and time dimension very short in case of surveys (*micro panel*). For *macro panel* the main problem is the cross section dependence. Therefore, a large strand of research exists in the literature that studies nonstationary panels, unit root tests and cointegration models.

3.5.1 Static and dynamic panels

In general, a linear model for panel data can be written as:

$$y_{it} = \alpha + x'_{it}\beta + u_{it} \tag{3.5}$$

where:

y_{it} is the dependent variable where *i* represents individuals (*i* = 1,…, *N*) and *t* represents time (*t* = 1,…*T*);

α is a scalar;

x_{it} is the vector of K explanatory variables for individual *i* in time *t.* Elements of β are indicated with $\beta_1, \ldots \beta_K$;

u_{it} is the error term.

In most panel data applications is used a *one-way error component model*. According to this, the error term includes two components:

$$u_{it} = \mu_i + \nu_{it} \tag{3.6}$$

where μ_i is the unobservable individual specific effect, while ν_{it} represents the remainder disturbance. It is important to notice that μ_i is time invariant and denotes the individual specific effects of *i,* which are not included in the regression. The other part of the error ν_{it} varies with individuals and over time.

A different one type of error is known as *two-way error component model.* According to this, disturbance can be decomposed into three parts:

$$u_{it} = \mu_i + \lambda_t + \nu_{it} \tag{3.7}$$

where the added component whit respect to (3.6) is λ_t, namely the time effect. As one can see in this case λ_t is considered a component individual invariant, which can be interpreted as a specific effect of the time, which is not included in the regression[40].

In nature, several economic relationships are dynamic. For example, the demand of addictive commodities, such as cigarettes (Baltagi and Levin, 1986) but also the empirical literature on crime (Buonanno, 2006) proposes the use of the dynamic panel data approach. What does this mean? Models described above are all static models, namely they do not take into account the effect of the past on present behaviors. For this characteristic, they sometimes could present the omitted variables problem.

The dynamic relationships are characterized by the presence of a lagged dependent variable among the explanatory variables. The baseline DPD model has the following form:

$$y_{it} = \delta y_{i,t-1} + x'_{it}\beta + u_{it} \tag{3.8}$$

where:

y_{it} is the dependent variable where *i* represents individuals (*i* = 1,…, *N*) and *t* the time (*t* = 1,…*T*);

δ is a scalar;

x_{it} is a vector of K explanatory variables for individual *i* in time *t.* Elements of β are indicated with $\beta_1, \ldots \beta_K$;

u_{it} is the error term known as *one-way error component model* (3.6), namely composed by two parts μ_i and ν_{it}.

In the model presented in equation (3.8), the persistence over time is caused by two sources. The former is represented by autocorrelation due to the presence of a lagged dependent variable among the explanatory variables: since y_{it} is a function of μ_i, as a consequence also $y_{i,t-1}$ is a function of μ_i. This means that an

[40] For an extensive description of two type of error see Baltagi (2014) chapters 2 and 3.

explanatory variable is correlated with the error term. Consequently, *ordinary least squares* (OLS henceforth) estimations are biased and inconsistent. The second source concerns individual effects characterizing heterogeneity among the individuals.

3.5.2 Fixed effect and random effect

Different models exist for panel data, among which the most common are the following two:

1) *Fixed effects model (FE)*[41]
2) *Random effects model (RE)*[42]

In the first model, individual specific effects μ_i are assumed to be fixed parameters to be estimates. The remainder part of the error is assumed to be stochastic with ν_{it} independent and identically distributed with null average and variance equal to σ_v^2 , namely IID (0, σ_v^2). The X_{it} are assumed to be independent of the ν_{it} for all i and *t.* The FE model is suitable when the idea is to estimate a model, in which the main interest is to observe individuals i_s behaviors, such as a certain number of firms, countries or regions. However, when the number of i_s is large, this regression is not appropriate due to the presence of N-1 individual dummies in the model. This technique, known also as *least square dummy variables (LSDV),* suffers from a large loss of degree of freedom, and, in addition is not able to estimate time invariant variables, which are wiped out by results because their variation from mean is equal to zero[43].

In the second case[44], individual specific effects μ_i are assumed to be random, indeed $\mu_i \sim IID\ (0, \sigma_\mu^2)$, $\nu_{it} \sim IID\ (0, \sigma_\nu^2)$ and μ_i is independent of the ν_{it}. The X_{it} are independent of the μ_i and ν_{it} for all *i* and *t.* The RE model is suitable when in the model, i_s are randomly drawn form a large population, such as a household panel drawn from a population.

After having described FE and RE model, the problem is which one should choose? This issue had caused a large debate in the literature, not only in the econometrics, but also in biometrics and statistics. A solution could be represented by the well-known specification test proposed by Hausman in 1978[45]. This test allows analyzing whether differences exist between two estimators and, even though its interpretation is not always correct, it remains the most common

[41] This model can be computed using the command *xtreg* in STATA 12 followed by the option *fe*. STATA software employs *xt* letters every time are performed panel data estimations. This occurs because it is necessary to specify the double dimension of the dataset.
[42] This model can be computed using the command *xtreg* in STATA 12 followed by the option *re*.
[43] This transformation is known as *Q transformation*.
[44] The random effect model (RE) is also known in literature as *generalized least square* (GLS).
[45] Hausman test can be computed using the command *hausman* in STATA 12 followed by the name of consistent estimator, then the name of efficient estimator.

test. Recently, about the Hausman test Baltagi (2014) said: *"unfortunately, applied researchers have interpreted a rejection as adoption of the FE model and nonrejection as adoption of RE model"* (Baltagi, 2014; p. 24). Actually, this test just allows comparing FE and RE estimators, both of which are consistent under the null hypothesis, but RE model is the best linear unbiased estimator, consistent and asymptotically efficient. The last becomes inconsistent in case of rejection of the null hypothesis. In other word, the Hausman test is useful to evaluate the RE efficiency, but is not appropriate to determine which model one should select.

3.5.3 Estimating dynamic panels: endogeneity, serial correlation and unit root problems

Endogeneity, namely the correlation between explanatory variables and error term, is one of the most common and serious problems in economic analyses. This is due to several reasons and the main consequence is that estimations performed by OLS turn to be inconsistent. For this reason, in order to obtain consistent estimations of parameters, it is necessary using analyses based on instrumental variables[46], such as *2SLS*[47]. This estimator is obtained through two steps of OLS estimations. The first one is a regression of explanatory endogenous variables on instruments (3.9).

$$x_k = Z\pi_k + \upsilon_k \tag{3.9}$$

where:

Z is the vector of instrumental variables.

The second regression is the original model, in which endogenous variables are substituted by predicted values from the first estimation (3.10).

$$\widehat{\beta_{IV}} = (\widehat{X'}\hat{X})^{-1}\hat{X}'\text{y} \tag{3.10}$$

where:

$\hat{X}$ can be interpreted as the instruments matrix.

The main problem of this type of estimators is the weakness of instruments. Indeed, if correlation between instrumental and endogenous variables is low, the estimator will be strongly biased. In an empirical application, identifying variables as a valid instrument *"is sometimes far from obvious"* (Verbeek, 2008; p. 143).

[46] Instrument variables are variables that are uncorrelated whit the error but correlated with the explanatory endogenous variable.

[47] This model can be computed using the command *xtivreg* in STATA 12. The difference with the command *xtreg* is the addition of instrumental variable *(iv).*

Another problem that can arise in panel data is the *serial correlation* or *autocorrelation*, namely the correlation between the error terms. In some economic relations, ignoring serial correlation when it is present produces inefficient estimates in the regression coefficients as well as biased standard errors (Baltagi 2014). According to Drukker (2003), among several tests to identify serial correlation in panel data models that have been suggested[48], the recent proposed by Wooldridge (2002) is *"very attractive because it requires relatively few assumptions and is east to implement"* (p. 168)[49]. Several simulations have been implemented by Drukker (2003) in order to test the power if this new test in samples having different sizes. Findings prove that the test has good power properties in samples with reasonably size. When the test shows evidence that serial correlation is present in the sample, it is recommended the use of the lagged dependent variable among the explanatory variables.

Hence, in order to solve those problems, have been proposed several solutions starting from the '80s. First Anderson and Hsiao (1982) then Arellano and Bond (1991), Ahn and Schmidt (1995), Arellano and Bover (1995) to Blundell and Bond (1998), to mention a few, studied alternative estimator to the OLS.

Anderson and Hsiao (1982) propose an estimator with instrumental variables in first differences (3.11). According to this estimator individual effects are wiped out from the regression due to the first difference transformation. Since the autocorrelation problem is not solved, authors suggest using as instrumental variables first differences of the lagged dependent variable $\Delta y_{i,t-2}$ as an instrument for $\Delta y_{i,t-1}$.

$$\Delta y_{it} = \delta \Delta y_{i,t-1} + \Delta x_{it} + \Delta u_{it} \quad \text{for } i=1,\dots N;\ t=2 \qquad (3.11)$$

Nevertheless the importance of this first solution, the estimator described above is not able to produce efficient estimations of the parameters, because it does not employ all the available moment conditions (Ahn and Schmidt, 1995).

Arellano and Bond (1991) posit a GMM[50] procedure more efficient than the previous one suggested by Anderson and Hsiao (1982)[51]. One of the advantages characterizing the GMM estimator is that it requires neither the knowledge of the

[48] Baltagi (2014) extensively describes tests for serial correlation. The most part of these tests makes specific assumptions about the nature of the individual effects or test for the individual-level effects jointly such as that by Baltagi and Li (1995).

[49] The Wooldridge test for serial correlation in panel data can be computet using the command *xtserial* in STATA 12.

[50] Hansen and Hansen and Singleton proposed the general theoretical GMM framework for the first time in 1982. Since then it is one of estimation methods more used both in economics and in finance.

[51] This model can be computed using the command *xtabond* in STATA 12. By default the software produces the Arellano-Bond *one-step* estimation. The *two-step* estimation is also available adding the option *twostep* in the end of the command line.

initial conditions error nor observation or distributional assumptions. It admits the presence of heteroskedasticity of unknown form[52]. Authors argue that additional instrumental variables can be obtained by using the orthogonality conditions that exist between lagged values of the dependent variable and the error term ν_i. Thereby, the model becomes a first differences model[53], known as *Difference GMM* (GMM-DIFF henceforth), but with multiple instruments (3.12).

$$y_{it} - y_{i,t-1} = \delta(y_{i,t-1} - y_{i,t-2}) + (\upsilon_{it} - \upsilon_{i,t-1}) \qquad (3.12)$$

Given the instrumental matrix $W = [W_1' \dots W_N']$ and the moment conditions given by the equation $E(W_i{}'\Delta\nu_i) = 0$, the model (3.12) becomes:

$$W'\Delta y = W'(\Delta y_{-1})\delta + W'\Delta\nu \qquad (3.13)$$

This GMM is famous as Arellano-Bond *one-step* estimator, which is distinguished by the *two-step* version, where $\Delta\nu$ is replaced by the differenced residuals obtained from the previous estimate (3.13). The GMM-DIFF estimator is consistent for $N \to \infty$ and for fixed T and, in general, it is consistent also for $T \to \infty$. Arellano and Bond (1991) show that such estimator has only a very limited finite sample bias and has smaller variance than the IV Anderson and Hsiao (1982) estimator. However, they underline that a drawback of the two-step DIFF-GMM is that it gives downward biased estimated standard errors, especially in finite samples.

The main critical analysis of Arellano and Bond (1991) is represented by Ahn and Schmidt (1995). They demonstrate that, using standard assumption for dynamic panels, additional nonlinear moment restrictions exist, not explored by Arellano and Bond. This work was extended by Arellano and Bover (1995) and by Blundell and Bond (1998). In particular, Arellano and Bover (1995) develop an estimator by using the GMM approach in the Hausman-Taylor (1981) contest[54]. While Blundell and Bond (1998) reconsider the importance of exploiting the initial condition, which has not been considered in previous model, except for Anderson and Hsiao (1982). They take into account an efficient

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[52] For an extensive list of the advantages of using GMM approach see Veerbek (2006) chap. 5 and for recent developments of this estimator see Baltagi (2014) chapter 8.

[53] First differencing consists of subtracting from the equation (3.12) the same equation lagged one period: $y_{i,t-1} = \delta y_{i,t-2} + u_{i,t-1}$. For the sake of semplicity, it is assumed that no other regressors are included in the (3.12), then the equation becomes: $y_{it} = \delta y_{i,t-1} + u_{it}$. The transformation is the following:

$$\begin{aligned}(y_{it} - y_{i,t-1}) &= \delta(y_{i,t-1} - y_{i,t-2}) + (u_{it} - u_{i,t-1}) \\ &= \delta(y_{i,t-1} - y_{i,t-2}) + (\mu_i - \mu_i)(\nu_{it} - \nu_{i,t-1}) \\ &= \delta(y_{i,t-1} - y_{i,t-2}) + (\nu_{it} - \nu_{i,t-1}).\end{aligned}$$

[54] The Hausman-Taylor estimator (1981) considers a model with some explanatory variables correlated with individual effects μ_i. In this respect, the model allows to estimate both exogenous and endogenous variables.

estimator for dynamic panels in case of small T and no exogenous regressors. The simple autoregressive model (AR1) with $E(\mu_i) = 0$, $E(v_i) = 0$ and $E(\mu_i v_i) = 0$ for *i*=1,2,..N and *t*=1,2,..T can be written as:

$$y_{it} = \delta y_{i,t-1} + \mu_i + v_{it} \tag{3.14}$$

Blundell and Bond attribute the bias and the low precision of the *First Difference* GMM estimator to the weak instruments problem. They conclude that could be more efficient using lagged differences of the dependent variable y_{it} as instruments for equations in levels, in addition to lagged levels of y_{it} as instruments for equations in first differences. For this reason, this estimator is well known as *System GMM* (GMM-SYS henceforth) [55], because it matches together - as a system - the Arellano-Bond (1991) moment conditions on first differenced equations with moment condition on equations in levels. When the series are persistent, the lagged levels of y_{it} are only weak instruments for the equations in first differences, while the lagged first differences remain informative, and hence valid instruments, for the equations in levels. Blundell and Bond (2000) and Blundell, Bond and Windmeijer (2000) confirm the efficiency gains of the SYS-GMM with respect to DIFF-GMM. The first one not only improves the estimations precision, but also reduces the bias due to the finite-simple, because explicitly built for sample with *"small T and large N"* (Roodman, 2009; p. 86).

Furthermore, a suitable check in panel data is to test whether there is a unit root or not into the autoregresion $y_t = \alpha\, y_{i,t-1} + \varepsilon_t$. Namely, if $\alpha = 1$ or $\alpha < 1$. This allows one to identify if the process is stationary or not, and, consequently to establish if a shock is permanent $(\alpha = 1)$ or if it goes to zero when $\alpha < 1$. Therefore, the unit root makes some difference and it is important to know it because for unit root processes many asymptotic distributions change. For instance, many economic and financial time series exhibit trending behavior or non-stationarity in the mean, such as asset prices, exchange rates and the levels of macroeconomic aggregates like real GDP.

As a result recently panel data unit root test have become very popular among applied researchers. According to Maddala and Lahiri (2009) the most common tests are the Levin-Lin and Chu (LLC; 2002), the Im-Pesaran and Shin (IPS; 2003) and the Maddala and Wu (MW; 1999). In implementing such tests, the null and the alternative hypotheses are often entirely different. For example, the LLC

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[55] This model can be computed in STATA 12 using the command *xtabond2*, recently made available by Roodman (2009). Options and possibilities of using this command are numerous. It considers the choice between *one-step* and *two-step*, the possibility to calculate robust estimates of the covariance matrix of the parameter, options *system* and *difference* GMM, choice of the number of variables lags. In addition, the command produces by default a list of statistics, such as the Arellano-Bond (1991) test for first and second order autocorrelation, Sargan (1958) and Hansen (1982) tests of joint validity of instruments.

has the null hypothesis that panels contain a unit root, while the IPS states that under the null, all panels have unit root. MW test assumes that all series are non-stationary under the null hypothesis against the alternative that at least one series in the panel is stationary. Some other tests, on the contrary, establish the null hypothesis so as that panels are stationary, namely that panels have not unit root. For this reason it is essential to know which is the H_0 for each test [56].

3.6 Data and empirical model

In the light of the theoretical approach of panel data framework, described in the previous paragraph, this part of the work focuses on an empirical application. As mentioned above, it is analyzed the relationship between tourism and crime for Italian provinces in the time span 1985-2003.

The baseline empirical model is represented by the following equation, in which the dependent variable $crime_{it}$ is a function of tourist arrivals, urbanization, deterrence, socio-economic and geographical factors:

$$crime^*_{it} = \beta_0 + \beta_1 crime^*_{i,t-1} + \beta_2\, tour_{it} + \beta_3\, dens_{it} + \beta_4 growth_{it} + \beta_5\, gdp_{it} + \beta_6\, unempl_{it} + \beta_7 dipl_{it} + \beta_8\, deter_{it} + \beta_9 DSouth_i + \beta_{10} Dyear_t + \eta_i + \epsilon_{it} \qquad (3.15)$$

The dependent variable $crime^*_{it}$ is the total number of crimes per 100,000 inhabitants in province *i* in year *t*. As pointed out in the section 3.4, this variable refers to crimes reported to the Judicial Authority by the Police Forces and includes both crime against person and crime property-related[57].

The variable of interest for the main purpose of this work is $Tour_{it}$, namely tourist arrivals per square kilometer in the official tourist accommodation[58], for both components national and international. Such variable, weighted by province size, measures the attractiveness of a given destination. According to the

[56] Unit root tests are available in STATA 12 by using the command *xtunitroot* followed by the test name and the variable name. The Levin-Lin-Chu (2002), have as the null hypothesis that panels contain unit root and is performed by using the option name *llc.* Harris-Tzavalis (1999), Breitung (2000; Breitung and Das 2005), Im-Pesaran-Shin (2003), and Fisher-type (Choi 2001) tests have as the null hypothesis that all the panels contain a unit root. They are performed by using the options name *ht, breitung, ips, fisher,* respectively. On the contrary, the Hadri (2000) Lagrange multiplier (LM) test has as the null hypothesis that all the panels are (trend) stationary and is implemented by using the option name *hadri.*

[57] See footnote 36 of the present Chapter for a detailed list of crime typologies recorded by ISTAT.

[58] See footnote 27 in Chapter 2 for a definition of tourist arrivals.

empirical literature on the crime-tourism relationship, a positive correlation is expected [59].

$Dens_{it}$ indicates the population of each province per square kilometer; it is used as an indicator of urbanization. According to Masih and Masih (1996), crime rises with urbanization for all types of crime analyzed (homicides, robberies, burglaries, motor vehicle thefts and frauds) except for serious assaults[60]. Glaeser and Sacerdote (1999) analyzing the connection between crime rates and cities size, demonstrate that a large urban density positively affects crime. It is due to the fact that in dense urban areas victims and criminal are more in contact, and also the returns per hour are higher because the number of victims could be higher or because the victims could be more promising.

$Growth_{it}$ and *Gdp_{it}* represent, respectively, the rate and level of Gross Domestic Product (GDP) per capita at 1995 constant prices. The expected sign related to the first one is negative because, as reported by Montolio and Planells (2013) this variable is connected to a more dynamic labor market and as a consequence, to more benefits and legal rather than illegal opportunities. The second one might have controversial sign: positive if it is interpreted as the potential benefit to commit a crime; negative if it captures the purchasing power of the population.

$Unempl_{it}$ is the unemployment rate. Cantor and Land (1985) theorize the macroeconomic relationship between the economic performance and criminal activity, indicating two opposite sources of incentive to criminal behavior: opportunity and motivation effect. The first one is linked to GDP and growth fluctuations: the opportunities to commit crime increase with economic performance, which leads to widespread availability of goods and profitable illegal activities. The second one works in the opposite way: the incentive to commit crime is caused by bad economic conditions. In other words, during recessions, the unemployment rate raises inducing individuals to increase their disposable income via illegal activities [61].

$Dipl_{it}$ indicates the average level of education in the *i*-th province at time *t*; a higher level of education might indicate a higher level of social cohesion, which could reduce crime offences.

$Deter_{it}$ is the ratio of recorded offences committed by known offenders over the total crime recorded. It is a proxy of the deterrence effect *"stemming from the efficiency of criminal investigation of the local police and from their knowledge of the local environment"* (Marselli and Vannini, 1997; p. 96). The expected sign is negative; therefore, a rise in the share of known offenders, due to an increase in deterrence or a higher level of efficiency/efficacy of police activity, reduces the crime rate.

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[59] See Biagi and Detotto (2014) for a complete literature review on this topic.

[60] Data refer on time span 1963-90 for Australia and are analyzed by a *vector error correction model* because authors find a long run relation between six typologies of crime (cointegration).

[61] The study is based on a time series 1946-82 for United States.

$DSouth_i$ is a control variable which equals 1 if the province is located in the South of Italy and zero otherwise[62].

$Dyear_t$ is a set of time dummy variables, which capture all changes common to all provinces, but changing over time. The inclusion of time dummies makes the assumption of no correlation across individuals in the idiosyncratic disturbances ε_{it} more likely to hold (Roodman, 2009).

Finally, η_i is the fixed effect for each province that captures all their unobserved characteristics and ε_{it} is the error term. It is assumed that $E(\eta_i) = 0$, $E(\varepsilon_{it}\ \eta_i) = 0$ and $E(\varepsilon_{it}) = 0$.

All variables, excepted for dummies, are expressed in logarithmic terms, so that the coefficients can be interpreted as elasticities. This is essential for the interpretation of the model because, by the transformation in logarithms, it is possible to measure the relative change in the dependent variable due to a relative change in one of the explanatory variables.

Variables employed in the analysis and their relative sources are depicted in detail in Table 3.3 and 3.4.

Table 3.3 Explanatory variables: list

Name	***Definition***	***Type of variable***	***Source***
Crime	Total crime offences per 100,000 inhabitants	Crime	ISTAT, Statistiche Giudiziarie Penali
Tour	Tourists official arrivals in tourist official accommodation per square kilometer	Tourism	ISTAT, Statistiche del turismo
Dens	Density of population per square Kilometer	Demographic	ISTAT, Atlante statistico dei comuni
Growth	Growth rate of real value added per capita	Economic	Istituto Tagliacarne
Gdp	Value added per capita at a base prices (Year = 1995	Economic	Istituto Tagliacarne
Unempl	People looking for a job/labor force * 100	Economic	Istituto Tagliacarne
Dipl	People with Italian diploma per 10,000 inhabitants	Human capital	ISTAT, Atlante statistico dei comuni
Deter	Ratio of incidents with unknown offenders over the total recorded per total crime	Deterrence	ISTAT, Statistiche Giudiziarie Penali
DSouth	Dummy variable that values one if a province is located in the South and zero otherwise	Geographic	Author's elaboration

Source: Author's elaboration

[62] Variables that assume only value 0 or 1 are called dummy variables.

Table 3.4 Explanatory variables: descriptive statistics

Name	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Crime	3,091.80	1,374.01	745.48	13,255.08
Tour	283.65	392.85	14.76	2,529.23
Dens	248.58	345.04	34.47	2,647.02
Growth	0.01	0.07	-0.81	0.77
Gdp	14,113.17	3,925.78	4,517.04	26,025.37
Unempl	10.94	6.71	1.7	33.2
Dipl	0.06	0.03	0.002	0.17
Deter	0.32	0.12	0.09	0.83
DSouth	0.36	0.48	0	1

Source: Author's elaboration

According to Buonanno (2006) and Buonanno and Montolio (2008) crime time series present strong persistence over time. This means that the level of crime activity at time *t* affects crime behavior at time *t+1*. One of the reasons why such inertia characterizes crime is the fact that criminals acquire know-how by doing and in the period *t+1* they have reduced the costs to commit a crime. To confirm this, the present analysis starts running a basic OLS estimate, both random and fixed effect. Then, it is applied the Wooldridge test (Wooldridge, 2002) to check for serial correlation in panel data; the test result indicates that the null hypothesis of no serial correlation is strongly rejected [63]. In these cases, it is recommended the use of the lagged dependent variable ($crime^{*}_{i,t-1}$) among the explanatory variables, in order to remove serial correlation in the residuals.

[63] Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 94) = 19.573
Prob > F = 0.0000

Moreover, some panel unit root tests (Levin, Lin and Chu, 2002; Im, Pesaran, and Shin, 2003) are performed to see whether stationarity of the dependent variable, and the null hypothesis of non-stationarity is strongly rejected[64].

As remarked in the descriptive part of this work (paragraph 3.4), a reverse causality between crime and tourism is strongly expected. For example, the presence of high crime rates in a given region could reduce tourism inflow; as a result, a drop in the economic performance can be observed. Unfortunately, criminal activity could directly impact the other explanatory variables. As shown in economic literature, crime is detrimental for the legal economy, discouraging investments, affecting the competitiveness of firms, reallocating resources and creating uncertainty and inefficiency (Detotto and Otranto, 2010). Through the economic channel, in a given province, crime could affect the density of population, increasing the incentive to move away from crime hot spots (Mills and Lubuele, 1997; Cullen and Levitt, 1999), and could also impact the human capital, reducing the expected human capital returns (Mocan *et al.,* 2005).

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[64] In the present analysis it used the option *llc* in order to perform the Levin-Lin-Chu test and the option *ips* for the implementation of Im-Pesaran-Shin test. Two test results are the following:

1) Levin-Lin-Chu unit-root test for ltcrime
Ho: Panels contain unit roots Number of panels =95
Ha: Panels are stationary Number of periods =19

AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag
LR variance: Bartlett kernel, 8.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	-24.1986	
Adjusted t*	-14.7854	0.0000

2) Im-Pesaran-Shin unit-root test for ltcrime
Ho: All panels contain unit roots Number of panels =95
Ha: Some panels are stationary Number of periods =19

AR parameter: Panel-specific Asymptotics: T,N -> Infinity sequentially
Panel means: Included
Time trend: Not included

ADF regressions: No lags included

	Statistic	p-value	Fixed-N exact critical values 1%	5%	10%
t-bar	-2.0637		-1.730	-1.670	-1.640
t-tilde-bar	-1.8171				
Z-t-tilde-bar	-5.4892	0.0000			

Finally, the reverse causality between crime rate and its deterrence variables has been already investigated in the economic empirical literature (see Dills *et al.,* 2008).

The presence of the lagged dependent variable and the lack of strict exogeneity between the crime variable and the explanatory variables, do not allow using the OLS method to estimate model (3.15) (Roodman, 2009). A possible solution is given by the GMM approach, which yields a consistent estimator of β using the lagged value of the dependent and explanatory variables as instruments. In this analysis, the System GMM estimator is used, because performs better than the linear first-differenced GMM in small samples as mentioned in the previous section.

In crime literature it is well known fact that the official crime data, coming from police reporting activity, suffer from underreporting and underrecording bias (Mauro and Carmeci, 2007). In other words, official data ($crime_{it}$) represent only the tip of the crime iceberg. The relationship between these two components can be represented as follows:

$$crime_{it} = \alpha\, crime_{it}^{*} + \delta_i + v_{it} \tag{3.16}$$

where:

$crime_{it}^{*}$ is the "real" unobserved crime rate,

δ_i is a fixed individual effect,

v_{it} is a vector of serially uncorrelated residuals.

It is worth noticing that the expected value of the official data yields a downward biased estimate of the observed crime rate, and such bias depends on the α coefficient in (3.16). Indeed, the underreporting problem becomes negligible when α is close to one and δ_i to zero. As shown in Fajnzylber *et al.* (2002), the measurement error does not modify the assumptions and the properties of the GMM approach, which can still provide consistent parameter estimates in panel data models with lagged variables and unobserved time-invariant individual-specific effects. In addition, the System GMM approach reduces the problems of measurement errors (Griliches and Hausman, 1986), which makes it preferable to alternative methods.

Notably, substituting equation (3.16) in model (3.15), the model is the following:

$$crime_{it} = \tilde{\beta}_0 + \beta_1 crime_{i,t-1} + \tilde{\beta}_2 tour_{it} + \tilde{\beta}_3 dens_{it} + \tilde{\beta}_4 growth_{it} + \tilde{\beta}_5\, gdp_{it} + \tilde{\beta}_6 unempl_{it} + \tilde{\beta}_7 dipl_{it} + \tilde{\beta}_8 deter_{it} + \tilde{\beta}_9 DSouth_i + \tilde{\beta}_{10} Dyear_t + \tilde{\eta}_i + \mu_{it} \tag{3.17}$$

where:
$\tilde{\beta}_j = \alpha\beta_j,$
$\tilde{\eta}_i = \delta_i(1-\beta_1) + \alpha\eta_i,$
$\mu_{it} = -\beta_1 v_{i,t-1} + v_{it} + \alpha\varepsilon_{it}$.

Since, by construction, α is between zero and one, the sign of all $\tilde{\beta}$ coefficients is still correct but their absolute values are lower than the "real" ones. Hence, this should be taken into account when deriving policy implications using the latter estimates; basically, we can easily infer that the estimated elasticities are lower than the "real" ones, and such discrepancy becomes seriously large as α approaches zero.

A crucial assumption for the validity of GMM estimates is that the instruments are exogenous. The Sargan (1958) test of overidentifying restrictions tests the overall validity of the instruments: failure to reject the null hypothesis gives support to the model. But if the errors are (suspected to be) non-spherical[65], the Sargan test is inconsistent. In the present analysis, since the robust standard errors are estimated, in order to correct for heteroskedasticity or cross-correlation in the residuals, the Hansen (1982) test is performed under the null hypothesis of the joint validity of the instruments. If the null hypothesis is rejected, the specification of the model is not valid, as the observations in the sample do not suit to all the moment restrictions jointly. Another important issue is the Arellano-Bond (1991) test for autocorrelation of the residuals, which checks whether the differenced error term is first and second order correlated. Failure to reject the null hypothesis of no second-order autocorrelation indicates that the residuals are not serially correlated.

3.7 Results

Three main parts compose the present paragraph. They present respectively the results obtained by: panel OLS estimates (section 3.7.1), GMM models estimates (section 3.7.2) and, finally, findings obtained discriminating tourists and resident population for victimization rates (section 3.7.3).

[65] When disturbances are heteroscedastic (the variance of the residual is not uniform) or autocorrelated they are called non-spherical.

3.7.1 OLS estimates: results

In a first stage, the model described in the previous paragraph (equation 3.17) is estimated as a static panel, namely excluding the lagged dependent variable ($crime_{i,t-1}$) from the explanatory variables. First, random and fixed effects models are performed, and results are illustrated in columns 1, 2 and 3 of the table 3.5.

The first column shows coefficients obtained by the FE model, while columns two and three illustrate the coefficients of RE models. Since FE wipes out the time invariant dummy *DSouth* [66], two different RE are regressed. In column 2, the model is very akin to that in column 1; while in column 3 the variables *DSouth* is added. It is important to note that, except for *Tour* and *Dens* variables, the other coefficients remain stable in terms of sign and level of significance. The Hausman test rejects the null, meaning that the RE estimator is not consistent [67]. As emphasized in the section 3.5.2, this test is not able to indicate which is the best model to choose. In fact, in the FE model, *Tour* variable has a negative impact on crime and it is significant at 10% level. Such puzzling result might be due to bi-directional causality between crime and tourism. Indeed, tourism could cause an increase of crime, but at the same time crime could represent a *deterrent to tourism* (Montolio and Plannels, 2013; p.3).

[66] This is due to the *Q transformation* already described in the section 2.4.1.

[67] hausman fe re

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(23) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 128.41
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

Table 3.5 Panel OLS: results

MODELS	*(1)*	*(2)*	*(3)*
	FE	***RE***	***RE***
VARIABLES			
Tour	-0.050*	0.041**	0.062***
	(0.028)	(0.019)	(0.019)
Dens	-0.57***	0.16***	0.15***
	(0.19)	(0.031)	(0.031)
Growth	-0.11	-0.050	-0.087
	(0.071)	(0.072)	(0.072)
Gdp	0.23***	0.16***	0.23***
	(0.056)	(0.050)	(0.054)
Unempl	-0.11***	-0.047**	-0.072***
	(0.021)	(0.019)	(0.020)
Dipl	-0.028	-0.028	-0.027
	(0.018)	(0.019)	(0.019)
Deter	-0.26***	-0.28***	-0.28***
	(0.022)	(0.021)	(0.021)
DSouth			0.21***
			(0.054)
Constant	8.89***	5.20***	4.00***
	(1.18)	(0.51)	(0.54)
Observations	**1,710**	**1,710**	**1,710**
R-squared	**0.529**		
Number of provinces	**95**	**95**	**95**

All regressions include time dummies; the dependent variable is the log of total crime per 100,000 inhabitants. Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively.

An important issue to check at this point of the analysis is the potential endogeneity between tourism and crime. If tourism is endogenous, it is expected that a shock in crime rate would impact tourism arrivals. In such cases, OLS estimates could produce biased estimations of the main variable of interest, hence is required a different estimator. The purpose is to identify an instrumental variable, which is correlated with *Tour* but uncorrelated with *Crime.* In order to do so, the provinces are divided according to their characteristics:

1) Provinces including art cities,
2) Provinces with 50% of mountain surface,
3) Provinces on the coast,
4) Other types of destinations.

The first group contains the provinces with art cities[68]; the second includes provinces with more than fifty percent of mountain in their territory[69]; the third considers the provinces on the coast[70]; and the fourth consists of provinces not included in any of the previous categories. It is used the yearly average of arrivals per group to instrument the *Tour* variable, because a crime shock in an art city probably affects that city's tourism flows but it does not impact the average level of tourism in art cities as a whole. In this sense, the variation of arrivals in a given province has a negligible effect on the average arrivals in the related group.

The results of the 2SLS estimate are presented in columns 1, 2 and 3 of Table 3.6. In general, coefficients seem to be stable with respect to OLS estimates, except for *Tour*. After correcting for endogeneity, the sign of the tourism variable turns out to be positive, although not significant (column 1). Again, the Hausman test is performed and it suggests RE estimator is not consistent[71].

At this stage, it is performed the Wooldridge test in order to check for possible serial correlation in the residuals (Wooldridge, 2002)[72]; this statistic test strongly suggests the use of the lagged dependent variable ($crime_{i,t-1}$). The presence of the lagged response variable requires a GMM approach that allows having consistent estimates.

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[68] The list includes 32 provinces: Ancona, Aosta, Bari, Bergamo, Bologne, Bolzen, Cagliari, Catania, Ferrara, Florance, Genova, L'Aquila, Lecce, Milano, Naples, Padua, Palermo, Perugia, Urbino, Pisa, Reggio Calabria, Rome, Siena, Siracusa, Terni, Turin, Trento, Trieste, Udine, Venice, Verona (http://www.discoveritalia.it/cgwe/index.asp?lingua=en).

[69] The list includes 18 provinces: Aosta, Avellino, Belluno, Benevento, Bergamo, Bolzen, Brescia, Como, Cuneo, Isernia, L'Aquila, Pistoia, Potenza, Rieti, Sondrio, Turin, Trento, Udine.

[70] The list includes 50 provinces: Agrigento, Ancona, Ascoli Piceno, Bari, Brindisi, Cagliari, Caltanissetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Cosenza, Ferrara, Foggia, Forlì-Cesena, Genoa, Gorizia, Grosseto, Imperia, La Spezia, Latina, Lecce, Livorno, Lucca, Macerata, Massa Carrara, Messina, Napoli, Nuoro, Oristano, Palermo, Pesaro-Urbino, Pescara, Pisa, Ragusa, Ravenna, Reggio Calabria, Roma, Rovigo, Salerno, Sassari, Savona, Siracusa, Taranto, Teramo, Trapani, Trieste, Venice, Viterbo.

[71] hausman feiv reiv

```
 b = consistent under Ho and Ha; obtained from xtivreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtivreg

 Test:  Ho:  difference in coefficients not systematic

          chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =      89.03
         Prob>chi2 =     0.0000
         (V_b-V_B is not positive definite)
```

[72] Wooldridge test for autocorrelation in panel data

```
H0: no first-order autocorrelation
F( 1,     94) =     19.218
Prob > F =      0.0000
```

Table 3.6 2SLS: results

MODELS *VARIABLES*	*(1)* *FE-IV*	*(2)* *RE-IV*	*(3)* *RE-IV*
Tour	0.33	0.28***	0.26***
	(0.25)	(0.059)	(0.055)
Dens	-0.51**	-0.039	-0.0089
	(0.20)	(0.056)	(0.052)
Growth	-0.060	0.030	-0.057
	(0.081)	(0.078)	(0.075)
Gdp	0.15*	-0.016	0.17***
	(0.078)	(0.065)	(0.058)
Unempl	-0.12***	-0.032	-0.080***
	(0.024)	(0.020)	(0.021)
Dipl	-0.039*	-0.042**	-0.037*
	(0.021)	(0.020)	(0.019)
Deter	-0.26***	-0.29***	-0.28***
	(0.023)	(0.022)	(0.022)
DSouth			0.36***
			(0.067)
Constant	7.35***	6.50***	4.71***
	(1.60)	(0.62)	(0.58)
Observations	**1,710**	**1,710**	**1,710**
Number of provinces	**95**	**95**	**95**

All regressions include time dummies; the dependent variable is the log of total crime per 100,000 inhabitants. Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively.

3.7.2 GMM estimates: results

In order to correct the estimation bias and take into account the persistence over time presented by criminal activity, it is estimate a dynamic model (3.17) by using the GMM-SYS approach. Results and diagnostic tests are reported in Table 3.7 (columns 1, 2 and 3). The Hansen test (1982) under the null hypothesis of the joint validity of the instruments does not reject the H_0. Nevertheless, the *p*-value of 1 is quite implausible, and this could be due to the number of T rather than a symptom of instruments proliferation. In fact, even when the instrument set is collapsed to reduce the instrument count, *p*-value does not decrease[73]. In addition, the Arellano Bond (1991) test indicates that residuals are not serially correlated.

[73] The option *collapse* is a suboption of the command *xtabond2*. This specifies that *xtabond2* should create one instrument for each variable and lag distance, rather than one for each time period, variable, and lag distance.

As the diagnostic tests support the final specification, it is essential to present detailed comment about the outcomes. As one can see on the table below, the variable *DSouth* is never significant and the estimates in columns 1, 2 and 3 are almost comparable. For these reasons, the most part of comments is based on the first column.

The coefficient of the lagged dependent variable ($crime_{i,t-1}$) is strongly significant and equal to 0.83, showing high persistence in crime series and confirming empirical literature findings. Furthermore, such value is in line with the recent analysis by Montolio and Planells (2013) for the case of Spanish provinces. Indeed, they find a coefficient equal to 0.73 for serious crime and 0.86 for minor crimes against the person, while the value 0.60 is estimate for minor property crimes[74]. The impact of tourism (*Tour*) on crime rate is positive, as expected, and highly significant. A one per cent increases in the number of tourist arrivals increases the rate of total crime offences by 0.02%. It is worth noticing that results do not change when the model is re-estimated using different measures of tourism (tourist arrivals or overnight stays per population, per square meters, etc.). In addition, a model including the quadratic form of the tourism variable ($Tour^2$) has been tested and it is confirmed that, in the model in which total crime and tourism arrivals are considered, this relationship is linear (model 3 in Table 3.7).

In general, socio-economic variables and other explanatory have the expected sign. *Gdp* is significant and positively correlated to crime, meaning that it captures the potential benefit for the criminal to commit a crime. Therefore, a one per cent increases in this variable raises the crime rates by 0.09%. The unemployment rate (*Unempl*) also presents a positive and highly significant coefficient: a one per cent increase unemployment, 0.04% increases crime rate. The sense is that the higher the employment rates are, the more common illegal activities represent a way to increase income.

The variable indicating the deterrence (*Deter*) is significant and has the expected sign: an increase of the effectiveness of Police activities reduces the crime rate by 0.083%.

Three variables, *Growth, Dens* and *Dipl* show the expected signs, but they are not statistically significant. Economic growth and the level of urbanization at provincial level do not seem to affect crime rate in a significant way; while education, measured by the number of diploma per capita, show a negative sign, but any significance. The same results for these three variables were found for the case of Spain (see Montolio and Planells, 2013; p. 19).

[74] For serious property crimes the coefficient does not result stastistically significant.

In the end of the Table 3.7 it is reported the result of the test on joint validity of time dummies[75]. The level of significance is equal to 1%.

As discussed in paragraph 3.6, coefficients might underestimate the underlying relationship due to a measurement error in the dependent variable. As a consequence, the “real” impacts should be even higher that those reported in the present analysis. However, given the results, if the long-run equilibrium is assumed, the elasticities may be obtained by dividing each of the estimated coefficients by $(1-\beta_1)$, where β_1 is the coefficient of the lagged dependent variable: 0,018/1-0,83 = 0,106. Following this reasoning, the long run impact of tourism on crime in Italy is about 0.11%. In a time series analysis on the case of Miami, McPheters and Stronge (1974) find that the short run elasticity of crime with respect to tourism is 0.03%, in line with the 0.02% found in the present work. Jud (1975) in a cross section analysis on 32 Mexican States reports 0.34%. In a recent cross-section application on property related crime and tourism in Italy, Biagi and Detotto (2014) estimate the short run elasticity to be 0.22%.

[75] This test can be computed in STATA 12 using the command *test* followed by the list of variables. It performs the Wald test of simple and composite linear hypotheses about the parameters of the estimated model.

Table 3.7 GMM-SYS: results

MODELS *VARIABLES*	*(1)*	*(2)*	*(3)*
$Crime_{t-1}$	0.83***	0.83***	0.83***
	(0.018)	(0.018)	(0.017)
Tour	0.018***	0.019***	0.023
	(0.0048)	(0.0050)	(0.018)
Dens	0.0066	0.0064	0.0066
	(0.0055)	(0.0055)	(0.0055)
Growth	0.091	0.090	0.065
	(0.12)	(0.12)	(0.11)
Gdp	0.089***	0.093***	0.081***
	(0.023)	(0.025)	(0.023)
Unempl	0.041***	0.040***	0.038***
	(0.0089)	(0.010)	(0.0091)
Dipl	-0.0065	-0.0067	-0.0047
	(0.0065)	(0.0065)	(0.0069)
Deter	-0.083***	-0.083***	-0.087***
	(0.015)	(0.015)	(0.015)
DSouth		0.0041	
		(0.015)	
$Tour^2$			-0.00043
			(0.0017)
Constant	0.34	0.31	0.43*
	(0.22)	(0.24)	(0.24)
Observations	**1710**	**1710**	**1710**
Number of provinces	**95**	**95**	**95**
Arellano-Bond (AR1)[1]	**0.000**	**0.000**	**0.000**
Arellano-Bond (AR2)[2]	**0.462**	**0.461**	**0.470**
Sargan Test[3]	**0.935**	**0.932**	**0.978**
Hansen Test[3]	**1.000**	**1.000**	**1.000**
Test on joint significance[4]	**36.33*** **	**34.51*** **	**35.93*** **

All regressions include time dummies; the dependent variable is the log of total crime per 100,000 inhabitants. [1]Arellano-Bond (1991) statistic test under the null hypothesis of no first order correlation in the residuals. [2]Arellano-Bond (1991) statistic test under the null hypothesis of no second order correlation in the residuals. [3]Sargan (1958) and Hansen (1982) statistic tests under the null hypothesis of the joint validity of the instruments. [4]Test on joint significance of time dummies. Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively.

3.7.3 Decomposing the impact of tourists and residents on crime

In the final step, it is explored whether the effect of tourists on crime is significantly different from that of residents. At this stage, the variables of interest are population, tourism nights of stay and size of the province. In order to compare resident and tourist population, the "equivalent tourist population" of each province is calculated considering the share of yearly number of nights spent by tourists in the official accommodations (ISTAT) over 365 days (equation 3.18):

$$Equivalent\_Tour = {}^{1}/_{365}\, overnight_{it} \qquad (3.18)$$

where:
i = 1,…,95 provinces
t= 1985,…, 2003 years

Therefore, *Equivalent_Tour* measures the total number of tourists in a given province per day. This variable replaces the tourist arrivals variable used in models 1, 2 and 3 (Table 3.7).

The new specification of equations (3.15) and (3.16) is the following:

$$y = m^k n^h d^v \, g(.)e \qquad (3.19)$$

where:
m = nights of stay in the year/365 (equivalent tourists per day)
n = resident population
d = area of the province in square kilometers
g(.) = controls
k, h, v = parameters

The equation to be estimated becomes:

$$\lg(y) = klg(m) + hlg(n) + vlg(d) + \cdots + \varepsilon \qquad (3.20)$$

where:

$$h = f(\alpha_1;\ \beta_1) \qquad (3.21)$$
$$k = g(\alpha_2;\ \beta_2) \qquad (3.22)$$

α_1 = propensity to be victimized of resident population;
β_1 = propensity to report of resident population;
α_2 = propensity to be victimized of tourists;
β_2 = propensity to report of tourists.

$$\frac{\partial h}{\partial \alpha_1} > 0; \frac{\partial h}{\partial \beta_1} > 0$$

$$\frac{\partial k}{\partial \alpha_2} > 0; \frac{\partial k}{\partial \beta_2} > 0$$

The effect of residents and tourists on crime can be compared by means of the $\widehat{h}$ and $\widehat{k}$ parameters. If $\widehat{h} > \widehat{k}$ the elasticity of crime with respect to the number of residents is higher than that related to the number of tourists.

The results are shown in columns 1-5 of Table 3.8. The outcomes are quite stable and similar to the ones obtained before (see *Gdp*, *Unempl* and *Deter* in models 1, 2, and 3 in Table 3.7). The coefficients of *Pop* and *Equivalent_Tour* have the expected sign and are strongly significant, therefore a one per cent increase in population and nights of stay leads to a rise on total crime respectively by 0.19% and 0.015% in the short run, and by 1.056% and 0.083% in the long run [76] . Since the coefficient of *Pop* is greater than the coefficient of *Equivalent_Tour,* therefore such results indicate that crime is affected more by resident population than tourists. Unfortunately, it is not possible estimate α and β of equations 3.21 and 3.22, which represent the victimization and reporting rates of the two sub-groups, because no data or publications on those rates are available. Since α and β are unknown and, $\widehat{h} > \widehat{k}$, it is possible hypothesize the following scenarios:

1. $\alpha_1 > \alpha_2 \, and \, \beta_1 > \beta_2$: when both the propensity to be victimized and to report are higher for residents than for tourists.
2. $\alpha_1 \gg \alpha_2 \, and \, \beta_1 \leq \beta_2$: when residents' propensity to be victimized is much higher than tourists', while their propensity to report is slightly lower.
3. $\alpha_1 \leq \alpha_2 \, and \, \beta_1 \gg \beta_2$: the propensity to be victimized of residents is slightly lower than that of tourists, while the propensity to report of residents is much higher.

Scenario 2 is the least common since it seems unlikely that tourists have higher propensity to report than residents. On the contrary, the opportunity cost of tourists is expected to be higher than non-tourists given the relatively short time they spend in the destination. Scenarios 1 and 3 have different policy implications; in the former residents are the main targets of criminal activity, while in the latter the opposite is true. Unfortunately, it is not possible to indicate which scenario fits the results of the present analysis.

In columns 3 and 4 is tested the robustness of $\widehat{h}$ and $\widehat{k}$. Specicifically in

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[76] The long run elasticity is computed by dividing each of the estimated coefficients by $(1-\beta_1)$, where β_1 is the coefficient of the lagged dependent. In the case of *Pop* and *Equivalent_Tour* is computed 0.19/1-0.82 and 0.015/1-0.82, respectively.

column 3, variables in the quadratic form are included both for *Pop* (Pop^2 and for *Equivalent_ Tour* ($Equivalent\_Tour^2$). Since both are not significant, the (log) linearity hypothesis is confirmed. In column 4, an interaction variable is added (*Pop*Equivalent_Tour*) in order to check the extent of any agglomeration effect on crime. The coefficient is not significant. The same effect is indirectly checked using the surface of the province (*Area*); the coefficient is significant and equal to -0.027. This means that a 1% increase in the province area (holding constant the number of tourists and population) leads to a 0.027% reduction of crime. Even for the variable *Area* the (log) linearity hypothesis is confirmed (column 5).

This results gives a first idea on the possible source of the negative externality found when total crime is analyzed: the impact of a rise in residents and tourists on crime is quite significant, which may indicate that the main forces driving tourism-crime relationship is the agglomeration effect. Hence, when total crime is considered, irrespectively of the subtypes of crime offences, overcrowded cities give criminals more opportunities to commit illegal activities. Probably, as the previous studies suggest (McPheters and Stronge, 1974; Jud, 1975; Fuji and Mak, 1980; Campaniello, 2011; Montolio and Planells, 2013; Biagi and Detotto 2014) the presence of tourists provides an incentive for certain illegal activities.

Table 3.8 GMM-SYS: additional results

MODELS *VARIABLES*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Crime$_{t-1}$	0.82***	0.82***	0.82***	0.82***	0.82***
	(0.020)	(0.021)	(0.017)	(0.019)	(0.020)
Equivalent_Tour	0.015***	0.016***	0.025	0.035	0.015***
	(0.0037)	(0.0038)	(0.024)	(0.032)	(0.0037)
Pop	0.19***	0.19***	0.15	0.20***	0.19***
	(0.024)	(0.025)	(0.091)	(0.030)	(0.024)
Area	-0.027***	-0.028***	-0.026***	-0.027***	-0.082
	(0.0066)	(0.0068)	(0.0065)	(0.0064)	(0.053)
Growth	-0.036	-0.038	-0.022	-0.026	-0.034
	(0.064)	(0.063)	(0.051)	(0.062)	(0.063)
Gdp	0.078***	0.084***	0.069***	0.076***	0.076***
	(0.027)	(0.027)	(0.024)	(0.025)	(0.027)
Unempl	0.031***	0.029**	0.029***	0.031***	0.030***
	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)
Dipl	-0.011	-0.011	-0.0069	-0.0080	-0.012
	(0.0073)	(0.0074)	(0.0069)	(0.0069)	(0.0074)
Deter	-0.085***	-0.086***	-0.094***	-0.088***	-0.086***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.016)
DSouth		0.0089			
		(0.014)			
Equivalent_Tour^2			-0.00050		
			(0.0014)		
Pop^2			0.0014		
			(0.0033)		
*Pop*Equivalent_Tour*				-0.0015	
				(0.0024)	
Area^2					0.0035
					(0.0035)
Constant	-1.52***	-1.57***	-1.17*	-1.64***	-1.31***
	(0.35)	(0.34)	(0.67)	(0.47)	(0.40)
Observations	**1710**	**1710**	**1710**	**1710**	**1710**
Number of provinces	**95**	**95**	**95**	**95**	**95**
Arellano-Bond (AR1)[1]	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Arellano-Bond (AR2)[2]	**0.476**	**0.475**	**0.469**	**0.469**	**0.476**
Sargan Test[3]	**0.735**	**0.719**	**0.898**	**0.847**	**0.727**
Hansen Test[3]	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
Test on joint significance[4]	**40.75*** **	**38.62*** **	**38.90*** **	**40.23*** **	**40.96*** **

All regressions include time dummies; the dependent variable is the log of total crime. [1]Arellano-Bond (1991) statistic test under the null hypothesis of no first order correlation in the residuals. [2]Arellano-Bond (1991) statistic test under the null hypothesis of no second-order autocorrelation in the residuals. [3]Sargan (1958) and Hansen (1982) statistic tests under the null hypothesis of the joint validity of the instruments. [4]Test on joint significance of time dummies. Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively.

3.8 Concluding remarks and limitations

The issue on the effect of tourism on the host community and namely on quality of life of resident population is relevant for policy makers. A wide strand of literature has analyzed the link between growth and tourism (*tourism-led growth hypothesis*); but, to date, a small number of studies have properly addressed the problem about negative externalities. In particular, the relation between crime and tourism becomes important in countries characterized by an increasing number of tourist arrivals, such as Italy.

In the present chapter has been analyzed a possible source of negative externality that exists when criminal activity develops in response to the presence of tourists. The central purpose of this analysis is to test whether the positive tourism-crime relationship that Biagi and Detotto (2014) find for property-related crime in a cross-section of Italian provinces, is persistent over time and holds when total crime is analyzed. In other words, this study analyses the dynamic relationship between tourists and total crime by using the OLS and System GMM approaches in a panel data framework.

Results show that tourism positively affects criminal activity; in the short run, a one-per-cent increase in arrivals leads to a 0.018% rise in total crime, while, in the long run, the impact is about 0.11%.

In addition, it is performed a comparison between the crime elasticity of residents and tourists, by re-estimating the model using the level of total crime instead of the rate of crime and equivalent tourist population (by replacing the tourist arrivals variable with nights of stay/365). Outcomes obtained demonstrate that the impact of resident population ($\hat{h}$) is higher than the one of the tourists and the difference between the coefficients associated with residents and tourists ($\hat{k}$) is significantly different from zero[77]. The results do not allow identifying which factor between the propensity of residents and non-residents to be victimized and to report to police plays the main role in $\hat{h}$ and $\hat{k}$.

This point, already mentioned in the paragraph 3.7.3, represents the main limitation of the analysis. Also, aggregate crime data such as total crime rate, could fail to signal the presence of differences among crime typologies. Indeed, it is reasonable to argue that the impact of tourists is higher for some types of crime, such as pick pocketing, bag snatching and fraud, and less for other types of illegal activities, such as financial crimes, handling and extortion. Finally, it is possible that the coefficients might underestimate the underlying relationship due to measurement errors in the dependent variable. The crime data used in this analysis

[77] Wald test under the null hypothesis of difference between two coefficients equal to zero. It is possible to reject the null at 1% of significance.
(1) Equivalent_Tour - Pop = 0
F (1, 94) = 53.99
Prob > F = 0.0000

are the total offences recorded by the Police, this probably represents just a small share of this phenomenon.

As further development, improvements may go in the direction of exploring how the relationship between crime and tourism changes according to: 1) the types of tourists (domestic and international); 2) type of crime (against property or against the person); 3) seasonality (tourist concentration in some period of the year).

CHAPTER IV

The effects of tourism on house prices in Italy

4.1 Introduction

The present chapter examines the effect of tourism activity on local house price dynamics by using the inverted demand approach employed in the housing market literature (Mankiw and Weil, 1989; Muellbauer and Murphy, 1997; Stevenson, 2008). This analysis looks at the case of Italy and provides evidence that property prices in Italian cities might be also affected by tourism activity. In the case of Italy, there is limited research that attempts to measure the effect of tourism on the housing market and house prices in particular. This issue is dealt with making use of a panel dataset at the urban level, with yearly observations for the period 1996-2007. A System GMM (GMM-SYS)[78] is performed to test the effect of tourism on house price dynamics in Italy. The tourism market is measured by employing a composite index, which encompasses both the tourism supply and tourism demand variables, thus capturing the complexity of the tourism sector.

Results suggest that the tourism/house price relationship is positive and significant. This outcome can be considered "good news" for cities: overall (on average) tourism would represent a positive externality and act in a supplementary way to boost urban economies in Italian cities.

The chapter is organized as follows: the section 4.2 shows the theoretical model of tourist externalities for the case under analysis. Section 4.3 reviews the relevant literature on the links between tourist activity and the housing market. Insights are offered from theoretical and empirical literature in the fields of tourism, housing economics and planning. Section 4.4 illustrates the data employed with a focus on the statistical characteristics of the dependent variable (4.4.1) and the composition and the methodology used to build the tourism index (4.4.2). The general model (4.5.1) and the empirical model employed (4.5.2) are presented in the fifth section, while section 4.6 presents the methodology of GMM estimator. Section 4.7 discusses the econometric results of the baseline model, and the robustness checks performed. Finally, the last part offers some tentative conclusions and outlines the possible policy implications of this work.

[78] See Chapter 3 of this dissertation (3.5.1) for a complete description of dynamic panel data analysis and GMM approach (3.5.3).

4.2 The externality of tourism on housing market

In line with the scheme used in the previous chapter, in the present section it is proposed a theoretical model, which could be the basis for understand which is the mechanism underlying tourism externality on house prices. How tourism can produce a rise in the house price? In a simplify model for consumer externalities are included:

x_{ij} = the amount of tourist good *i* consumed by individual *j,* for (i=1,…, n) and (j=1,…, m)

r_i = the total quantity of resource *i* available to the community

hp_k = the production of externality (variation in house prices) due to the presence of individual k

$z = \Sigma hp_k$ = variation in house prices in the destination

$u^j(x_{1j}, \dots, x_{nj}, z)$ = individual *j*'s utility function

The variable *z* in the utility function above indicates the possibility that the utility of residents in the destination *d* is affected by the variation in house prices. As Baumol and Oates (1988) observe *"there is a category of pseudo-externalities, the pecuniary externalities, in which one individual's activity level affects the financial circumstances of another, but which not produce a misallocation of resources in a world of pure competition"* (p. 29). In this context, the presence of tourists in a destination generates an increase in the number of house demanded, which in turn causes an increase in their prices. Consequently, this affects the welfare of residents in the destination, in the sense that local economies in tourist cities could improve. Following Candela and Figini (2012) the positive externality of consumption is the result of the so-called *friendly tourist hypothesis* (p. 530). Therefore the social welfare (W), stemming from the tourist activity in the destination (*T)*, can be algebraically written as the sum between the net private benefit of the tourism activity and the social external effect of the tourism on residents:

$$W(T) = B(T) + U(T) \quad (4.1)$$

In this case, tourism sector chooses the optimal amount of *T* on the basis of its *B(T)* without taking into account the social utility *U(T)* for the community. On the contrary, the community evaluates the optimal quantity of *(T)* by estimating the maximum of function (4.2):

$$W'(T^*) = B'(T^*) + U'(T^*) = 0 \quad (4.2)$$

Therefore, in this case there is a market failure: the tourism sector reaches a level that is lower than what would be optimal for the community. In other words, this is the opposite case to the negative externality of consumption described in the section 3.2. But, according to the United Nations Environment Programme increasing demand for basic services and goods from tourists will often cause price hikes that negatively affect local residents whose income does not increase proportionately. The example is given by the experience of Belize, where house prices increased by 8% as a consequence of tourism development. In this context, when house prices dramatically increase, resident population does not benefit from the presence of tourism, on the contrary have to sustain some costs.

4.3 Literature review[79]

Economic studies on the relation between tourism and house prices can be classified into two main strand of research: hedonic price method (HPM) and inverted demand approach.

In the next sections, two methods will be presented in a detailed manner along with a review of the literature up to date.

4.3.1 Hedonic price method (HPM)

According to Goodman (1998) the HPM has been used for the first time by Court in 1939. Nevertheless, this pioneering work is not the most cited one, but the most part of quotations about hedonic prices concern the seminal work published by Rosen (1974)[80].

As mentioned in Chapter 2 of the present dissertation, the HPM is based on the idea that *"goods are valued for their utility-bearing attributes or characteristics"* (Rosen, 1974; p. 34). Therefore, according to the author "*hedonic prices are defined as the implicit price of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them"* (p. 34). As a consequence, a price can be defined as follows:

[79] See also Biagi *et al.* (2012) for an extensive literature review on housing market and second homes.

[80] Goodman (1998) argues that the hedonic price analysis experienced three steps: *"invention, disappearance, and subsequent re-emergence"* (p. 291). Indeed, after the article published by Court in 1939, the method is popularized by Griliches only in the early 1960s with two papers; the first one on the price of fertilizers (1958) and the second one on the hedonic price of automobiles (1961).

$$p(z) = p(z_1, z_2, \dots, z_n) \tag{4.3}$$

Where z measures the amount of the *i-th* characteristics contained in each good:

$$z = (z_1, z_2, \dots, z_n) \tag{4.4}$$

The theoretical model proposed by Rosen, based on Lancaster (1966), states that the amount of characteristics and implicit prices of goods lead consumer and producer decisions to the market equilibrium. The main contribution of Rosen has been to establish a complete theoretical framework about hedonic prices. Indeed, the author suggests an analysis on the demand and supply side, along with the market equilibrium for heterogeneous goods. Econometrically, implicit prices are estimated by regressing the product price on characteristics, which are the qualitative features of heterogeneous goods. Rosen seeks to demonstrate that similar good with price differentiation correspond to a bundle of attributes that are different. As a consequence consumers tend to buy not the good *per se,* but the full package of characteristics. The utility function is the following:

$$U(x, z_1, z_2, \dots, z_n) \tag{4.5}$$

Where x represents all other goods consumed. Given the price of x equal to one and measuring income (y) in terms of units of x, the budget constraint becomes:

$$y = x + p(z) \tag{4.6}$$

In this context the consumer maximization requires maximizing the utility of x and z. Therefore, the expenditure a consumer is willing to pay for alternative values of characteristics $(z_1, z_2, \dots, z_n)$ at a given utility index and income is represented by (4.7). The willingness to pay (θ) is a function of the quantity of attributes embodied in the product (z), the utility (u) and the income (y).

$$\theta = \theta(z, u, y) \tag{4.7}$$

In line with the framework of demand side on HPM, Rosen develops also a model for the supply side. Since this will not be the subject of the present chapter and due to space limitations, the issue is not treated here[81].

[81] For a full description of the supply side and production decision in HPM see Rosen (1974) pp. 41-44.

Since the good "house" represents an example of heterogeneous good characterized by the presence of different levels of quantitative and qualitative attributes, such model has been used in several empirical applications in order to estimate house prices as a function of a set of attributes. Applying the HPM for this type of good means try to identify the weight of each attribute in the market price and, therefore, the value that consumers and producers give the single attribute.

Previous research on the relationship between tourism and property prices has focused on tourism-related accommodation such as hotels, apartments, cottages or holiday homes. In the majority of cases, the HPM is applied to explore the effect of location amenities on the price of tourism accommodation such as hotels (Espinet *et al.*, 2003; Hamilton, 2007)[82], holiday cottages rented by firms specialized in tourism accommodation (Le Goffe, 2000; Fleischer and Tchetchik, 2005; Taylor and Smith, 2000; Nelson, 2009)[83], and coastal single-family houses and small condominiums (Pompe and Rinehart, 1995; Rush and Bruggink, 2000; Conroy and Milosh, 2009)[84].

Other studies apply the HPM to evaluate the effect of the presence of open spaces such as public parks, natural areas, golf courses, and other types of amenities on all properties located in close proximity (Bolitzer and Netusil, 2000) to the metropolitan area as a whole or in suburban areas (Do and Grudnitski, 1995; Luttik, 2000; Anderson and West*,* 2006; Nicholls and Crompton, 2007)[85].

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[82] Espinet *et al.* (2003) study the effect on prices of the different characteristics/attributes of a holiday hotel in the sun-and-beach destinations in Spain (Lloret de Mar, Blanes and Tossa de Mar) between 1991 and 1998; Hamilton (2007) analyzes the average price of accommodation in the coastal districts of Schleswig-Holstein (Germany) by using landscape and other characteristics of these districts.

[83] Le Goffe (2000) examines the case of cottages prices in Britanny (western France); Fleischer and Tchetchik (2005) analysis is based on a surveys of 197 operators of rural accommodations in Israel; rental prices for beach properties in the coast of North Carolina over the period 1987-1992 are explored by Taylor and Smith (2000); Nelson (2009) uses a sample of 600 vacation houses in rural western Maryland, and regresses weekly rental prices on the proximity to lake and sky recreation.

[84] Pompe and Rinehart (1995) examine prices of ocean-front properties in two south Carolina coastal towns in the USA; Rush and Bruggink (2000) study a sample of privately owned houses within twenty-one towns of Long Beach Island (New Jersey); Conroy and Milosh (2009) evaluate a data set contained 9,755 observations of single family homes that were sold in San Diego County during 2006, in order to evaluate the additional value conferred on a residence from being located near the coast.

[85] Bolitzer and Netusil (2000) investigate on sale prices of homes located near open spaces in Portland (Oregon). Do and Grudnitski (1995) explore a data set of 717 observations on sales transactions for properties located near a golf course in Rancho Bernardo, a suburban area near San Diego (California); the same issue is analyzed by Nicholls and Crompton (2007) for a sample of 305 sales transactions in Pebble Creek (College Station-Texas). Luttik (2000) explores the effects of different environmental factors on house prices for eight towns or regions in the Netherlands; Anderson and West (2006) using a sample of 24,862 home transactions in the Twin Cities (Minneapolis-Saint Paul Metropolitan area) during 1997 estimate the effect of the proximity to open spaces on house prices, as done by Bolitzer and Netusil (2000).

The main shortcoming of these works is they are case-specific (*i.e.*, they focus on one city, one neighborhood, etc.) or amenity-specific (they examine the impact of beaches, parks, golf courses on hotel or property prices). As such, they do not analyze the effect of tourism activity as a whole (demand and supply factors). As a consequence main results of these studies are not able to describe a relation between tourism and house price that could be generalized.

Furthermore, the application of the hedonic approach to property values *per se* is not without drawbacks including: a) it requires microeconomic data very difficult to find (*i.e.*, house prices for individual properties); b) the majority of works use linear specifications, but the linearity of equilibrium in hedonic models is questioned (Ekeland *et al.*, 2004); and c) all the applications employ cross-sectional analysis rather than time-series or panel analysis[86].

4.3.2 Inverted demand approach

The second strand of research is the inverted demand approach. According to Malpezzi (1996) the demand of houses is a function of price (P), a vector of demographic factors (D) and a vector of income and wealth variables (I) as follows:

$$Q^d = f(P, I, D) \quad (4.8)$$

And the supply of houses depends on prices (P), geographical constraints (G) and regulation affecting supply (R), as follows:

$$Q^s = f(P, G, R) \quad (4.9)$$

As a consequence, the inverted demand and supply in equilibrium become:

$$P = f(I, D, G, R, e) \quad (4.10)$$

Where the error term (e) is included because the relations are stochastic.

Following the framework presented above, the effect of various drivers on house prices is empirically tested with equations representing inverted demand or supply. Moreover, given the difficulty to find data on the supply side of the market (such as, for instance, planning regulations and land use) and given the slow response of the housing supply and prices in producing any changes in the market, the majority of applied research focuses on the demand side (Mankiw and

[86] For a description of differences between cross-sectional, time series and panel analysis see Chapter 2 (footnote 18).

Weil, 1989; Muellbauer and Murphy, 1997; Tsastaronis and Zhu, 2004; Stevenson, 2008)[87]. Several studies use reduced equations including demand and supply factors, such as, for instance, the work of Malpezzi (1996) on a cross-section of US cities and Yu (2010) for a set of thirty-five Chinese cities over the time-span of 1998-2007 (see also Kajuth, 2010 for the case of Germany).

Overall, studies mainly focus on the analysis of the effects of economic and demographic factors on house prices. Few works employ panel or similar methods to control for fixed effects at a city or regional level (Capello, 2002, for ninety-five provincial capitals of Italy over the period 1963-1997; Yu, 2010). Several papers use cointegration analysis (Malpezzi, 1999, for one hundred thirty-three metropolitan areas in the US; Stevenson, 2008), while recently, other applications employ dynamic panel and GMM (Sadeghi *et al.*, 2012; Browing *et al.*, 2008; Kajuth, 2010; Wang *et al.*, 2012)[88]. However, as already stated previously, these studies do not specifically investigate the effect of place-related amenities or other types of externalities on house prices.

The main purpose of the present chapter is to demonstrate that the presence of tourism markets (not just a single type of tourist accommodation or tourism-related amenity) affects the price of properties located in metropolitan areas. For example, in the case of Italy, property prices might be affected not only by economic and demographic factors but also by each city's tourism activity. Only a limited amount of research that attempts to measure the effect of tourism on the housing market and house prices has thus far been conducted for the case of Italy. One of the few studies is that of Biagi *et al.* (2012) on a cross-section of Sardinian municipalities for the year 2001[89]. More recent work includes that of Cannari and Faiella (2008) in which the effect of tourism is explored using a sample of Italian municipalities for the year 2002. In this work, tourism is measured as the share of firms operating in the tourism industry; however, it is unclear which type of tourism-related businesses is included in the sector.

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[87] Mankiw and Weil (1989) analyze the impact of demographic changes on the US housing market and in particular the entry of the so called *baby boom* generation as house buyers; Muellbauer and Murphy (1997) examine the case of UK between 1957 and 1994; Tsastaronis and Zhu (2004) explore the determinants of house prices for seventeen industrialized countries (Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States); Stevenson (2008) studies the Irish market using quarterly data of house prices for the period 1978-2003.

[88] Sadeghi *et al.* (2012) study the relation between house prices and a set of macroeconomic variables for three cities of Iran (Tehran, Isfahan and Mashhad) for thirty-one years; Browing *et al.* (2008) investigate whether the wealth effect can explain the development in consumption and house prices in Denmark in 1987-1996, the sample includes 10% of Danish population; Kajuth (2010) uses annual data on house prices in Germany over the period 1975-2008; Wang *et al.* (2012) explore a dataset including 8,134 observations from 2000 to 2006 on transaction prices for Taiwan.

[89] The exercise of Biagi *et al*. (2012) is based on a previous work of Biagi and Faggian (2004). In this context the tourism index is presented for the first time.

4.4 Data

4.4.1 House price in Italy

According to the Bank of Italy, the real estate sector in the country (building investments, rent expenses and brokerage services) represents approximately 20% of the national GDP. For the Ministry of Finance, in 2010, the average house price per square meter in Italy was approximately 1,578 euros.

Despite the importance of the housing sector for the national and local economy, the Italian National Institute of Statistics (ISTAT) does not provide any official house price data series. Applied research employing house price data for Italy makes use of data derived from six main sources.

1) *Agenzia del Territorio*, a specific agency of the Italian Ministry of Finance, publishes the so-called *Osservatorio del Mercato Immobiliare* (OMI). The OMI dataset provides house prices for all Italian municipalities (8,100) and is extremely accurate and useful for micro-level analysis. Nevertheless, it has been criticized (see Cannari *et al.*, 2006); first, for under-reporting house prices (as information is based on housing contract data rather than real house prices), and second, for not being available for a sufficient time span (data are only available starting from 2002).

2) Bank of Italy since 1965 has produced a survey called, "Survey of Household Income and Wealth". It contains house prices from a small, representative sample of approximately 8,000 households located in fifteen Italian municipalities with a population of 250 thousand inhabitants and in fifteen surrounding areas. Similar to the OMI dataset, this dataset also has the problem of under-reporting real house prices because dwelling prices are based on the subjective evaluation of the interviewed tenants and homeowners.

3) *Nomisma*, a private research center in economics, starting in 1988 has collected house price quotations reported by a sample of real estate agencies for a very limited number of urban areas. This database has a very limited geographical coverage; the sample includes thirteen large provincial capitals and thirteen medium-size provincial capitals.

4) *Scenari Immobiliari*, a private research center specializes in the real estate market, since 1999, has published the so-called "real value database" that provides current house and rent prices at the neighborhood level.

5) *Consulente Immobiliare,* a professional newspaper published one biweekly by the Italian financial newspaper "Il Sole 24ore", which contains house price quotes from real estate agents. Until 2000, house price quotes were available for the provincial capitals (103 observations). Beginning in 2000, this dataset was expanded to also include quotes for more than 1,200 Italian municipalities. For the provincial capitals, the prices collected refer to "new" or "recently built" (no older than 35 years old) dwellings sited in three types of locations: the town

center, the outskirts, and between the outskirts and the town center. However, for the other type of municipalities, data are collected for "new" or "completely renewed houses". The disadvantage of this database is that the series have several breaks.

6) Annuario Immobiliare, a property directory published by the Italian financial newspaper, "Il Sole 24Ore". This source provides time series data on the average value (per square meter) of new housing and residential buildings located in the center, semi-center and outskirts of one hundred and three cities in Italy[90].

Table 4.1 furnishes a summary of six sources.

Table 4.1 Sources of data on house prices in Italy

Source	*Frequency*	*Data collection period*	*Geographical coverage*	*Type of dwelling*	*Begin of the series*
1.Agenzia del territorio	semi-annual	semester average	stratified sample of all municipalities	4: town center, outskirts, between, rural areas. All type of dwellings	2002
2.Banca d'Italia	bi-annual	Interview	representative sample of Italian households	All type of dwellings	1977
3.Nomisma	semi-annual	May-November	8,155 municipalities	4: luxury areas, town center, between outskirts and center, outskirts. New, old, houses to be restructured.	1988
4.Scenari Immobiliari	bimestral	not relevant	provincial capitals and other municipalities	3: town center, between outskirts and center, outskirts. Houses and offices	1999
5.Consulente Immobiliare	semi-annual	semester average	since 2000, all provincial capitals and 1,000 municipalities	3: town center, between outskirts and center, outskirts. New or recently built (for provincial capitals). New or completely renewed (for non provincial capitals).	1965
6.Annuario Immobiliare	annual	yearly	103 provincial capitals	6: center, outskirts, between: houses and shops New dwellings	1967-2010

Source: Author's elaboration

The source of house price data employed in the present study is *Annuario Immobiliare.* Empirical works that has employed this data set include that of Capello (2002) in which the determinants of urban development in Italy was

[90] These cities are all provincial capitals. Italian provinces are the second of the three local government administrative areas in Italy: regions, provinces, and municipalities.

analyzed, and the work by Caliman (2008, 2009) and Caliman and Di Bella (2011)[91] in which house price dynamics was investigated with particular emphasis on the effects of the housing market bust on house prices in Italy.

House price data of *Annuario Immobiliare* for the period of 1967-2007 indicate that prices of new dwellings (per square meter) in the one hundred and three Italian cities analyzed increased by 15.6% per year[92]. Overall, four main phases can be identified in the evolution of the real prices of new dwellings[93]. The end of the sixties and the first half of the seventies were characterized by the rise of prices due to the 1973 oil shock, which has increased investment in dwellings. The rise then accelerated starting in 1978, presumably due to the prospective oil shock, and continued until the beginning of the eighties. Since the second half of the eighties, house prices decelerated due to the worsening outlook in household income; however, in the second part of this period, quotations increased quite sharply, peaking in 1992. A prolonged recession started in 1992 and lasted until 1999. Since then, a moderate recovery was observed starting in 2000, which was accelerated in 2001 (+10.5%) and was followed by a moderate slowdown since then.

During 1967-2007, the prices of dwellings located in different areas of the cities grew at different paces. More specifically, house prices in city centers increased more than in semi-centers and in outskirts. As Figure 4.1 shows, house prices in these three locations followed similar trends until the 1970s; after that period, they started to diverge slightly.

Map 4.1 shows the distribution of house prices per square meter for the Italian provincial capitals in 2007. As noted in the map, the areas with the highest house prices are concentrated in the northern part of the country[94] (see also Table 4.2).

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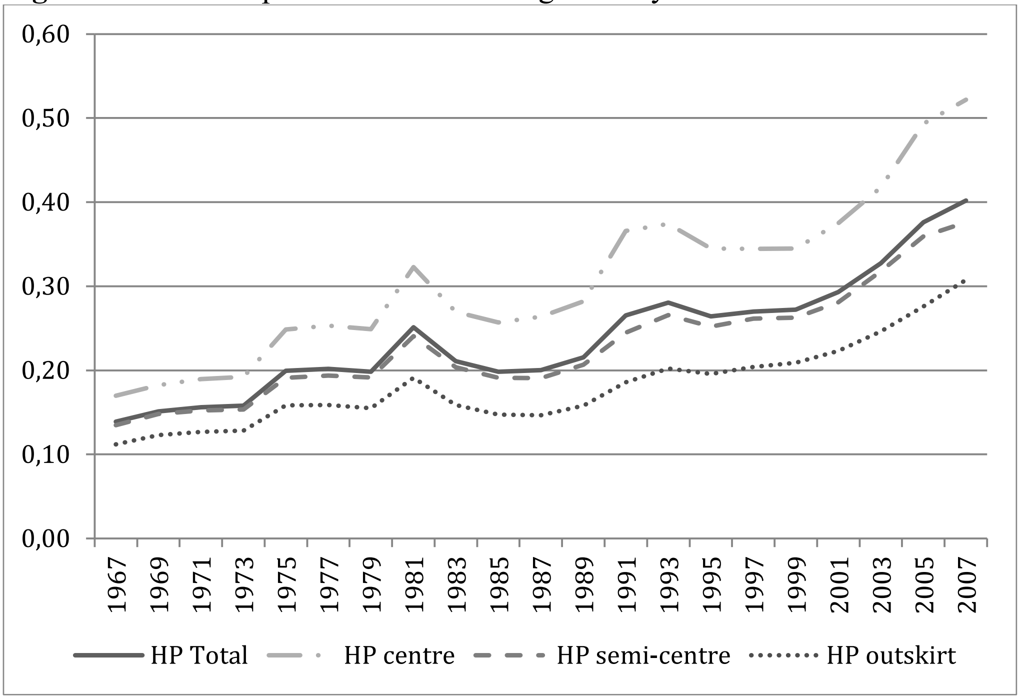
[91] More precisely, Caliman (2009, 2011) uses data of "Consulente Immobiliare" published by the same source (Sole24ore) that is updated biyearly. In addition, the source and type of data are the same as that of the "Annuario Immobiliare".

[92] One hundred and three provincial capitals are: Agrigento, Alessandria, Ancona, Aosta, Arezzo, Ascoli Piceno, Asti, Avellino, Bari, Belluno, Benevento, Bergamo, Biella, Bologna, Bolzen, Brescia, Brindisi, Cagliari, Caltanissetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Como, Cosenza, Cremona, Crotone, Cuneo, Enna, Ferrara, Florence, Foggia, Forlì Cesena, Frosinone, Genoa, Gorizia, Grosseto, Imperia, Isernia, La Spezia, L'Aquila, Latina, Lecce, Lecco, Livorno, Lodi, Lucca, Macerata, Mantova, Massa Carrara, Matera, Messina, Milan, Modena, Naples, Novara, Nuoro, Oristano, Padua, Palermo, Parma, Pavia, Perugia, Pesaro Urbino, Pescara, Piacenza, Pisa, Pistoia, Pordenone, Potenza, Prato, Ragusa, Ravenna, Reggio Calabria, Reggio Emilia, Rieti, Rimini, Rome, Rovigo, Salerno, Sassari, Savona, Siena, Siracusa, Sondrio, Taranto, Teramo, Terni, Turin, Trapani, Trento, Treviso, Trieste, Udine, Varese, Venice, Verbano Cusio Ossola, Vercelli, Verone, Vibo Valentia, Vicenza, Viterbo.

[93] Using a different data source, Muzzicato *et al.* (2008) observed the same phases.

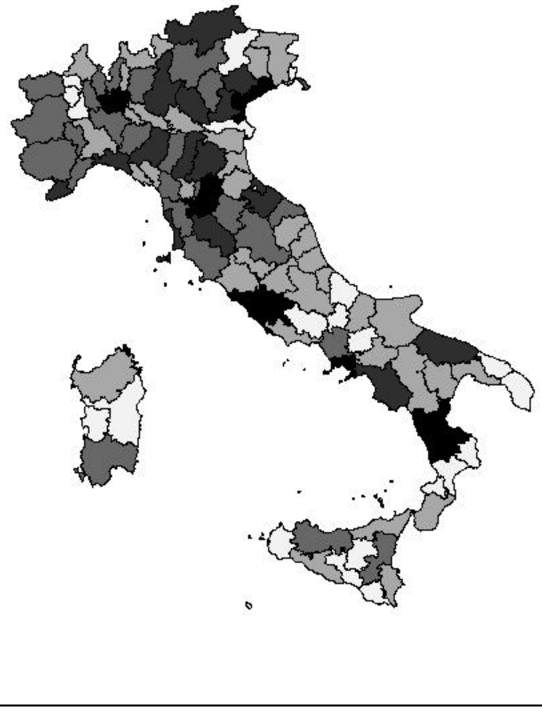
[94] Maps included in this dissertation have been create by using the ArcView GIS 3.3 software, which provides a set of functions for mapping, editing geographic and tabular data and spatial analysis, based on a geospatial vector of geographical information known as "shapefile". Shapefiles give information about spatial features in a data set supporting point, line and area features, represented by double-digitized polygons (www.esri.com).

Figure 4.1 Real prices of new dwellings in Italy. 1967-2007



Source: Author's elaboration on *Annuario Immobilare* of "Il Sole 24ore" and ISTAT Consumer Price Index

Map 4.1 Prices of housing in Italian provincial capitals. Year 2007



Top ten provincial capitals for prices of housing (Euros per square meters). Year 2007

Provinces	*Prices*
1 Milan	7,667
2 Cosenza	7,000
3 Rome	6,600
4 Naples	5,833
5 Venice	5,333
6 Florence	4,933
7 Siena	4,533
8 Salerno	4,200
9 Bologna	4,133
10 Rimini	3,833

Legenda

- 4933.33 - 7666.67
- 3266.67 - 4933.33
- 2533.33 - 3266.67
- 1900 - 2533.33
- 1266.67 - 1900

Note: the ten provinces with the lowest prices of housing are: Ragusa (1,267), Vibo Valentia (1,400), Gorizia (1,400), Nuoro (1,433), Enna (1,533), Crotone (1,533), Trapani (1,567), Isernia (1,567), Catanzaro (1,567), Brindisi (1,567).

Source: Author's elaboration on *Annuario Immobilare* of Sole 24ore

Table 4.2 House prices at regional level
(Average price per square meter, new dwellings, 2007)

Region	*Price*	*Regional Capital*	*Price*
Piedmont	2,329	Turin	2,867
Valle d'Aosta	2,600	Aosta	2,600
Lombardy	3,127	Milan	7,667
Trentino Alto Adige	3,317	Trento	3,167
Veneto	3,205	Venice	5,333
Friuli Venezia Giulia	2,129	Trieste	2,533
Liguria	3,158	Genoa	3,533
Emilia Romagna	3,037	Bologna	4,133
Tuscany	3,243	Florence	4,933
Umbria	2,417	Perugia	2,833
Marche	2,675	Ancona	2,933
Lazio	2,927	Rome	6,600
Abruzzo	2,108	L'Aquila	2,300
Molise	1,933	Campobasso	2,300
Campania	3,340	Naples	5,833
Puglia	2,240	Bari	3,433
Basilicata	2,017	Potenza	2,100
Calabria	2,787	Catanzaro	1,567
Sicily	1,989	Palermo	2,800
Sardinia	2,008	Cagliari	2,900
North-West	2,844		
North-East	2,951		
Center	2,981		
South and Islands	1,995		
Italy	2,717		3,618

Source: Author's elaboration on *Annuario Immobilare* of Sole 24ore

4.4.2 The tourism index

Data on the supply of formal tourist accommodation are a good proxy for the tourism 'orientation' of destinations; however, they underestimate the phenomenon because many tourists choose informal tourist accommodation, such as apartments. According to Gambassi (2006), formal tourist accommodation in Italy represents only one-third of actual tourist arrivals. To overcome this limitation, in this work and following the previous exercise of Biagi *et al.* (2012), the tourism market is measured through a tourism index[95]. The use of a composite measure is in line with the composite nature of tourism (see Stabler *et al.* 2010; Sinclair and Stabler 1997) and should provide a continuous indicator that includes demand and supply side aspects. The index is composed of the following four variables (see Table 4.3):

[95] See the Appendix of the present chapter for a detailed list of other tourist indexes.

1) Total number of formal tourist accommodation (*Total Accommodation*). Other than providing information about the number of businesses operating in the formal tourist accommodation, this *tourism supply* variable works as a proxy for local amenities directly linked to the tourism sector (restaurants, spas, bars, gyms, etc.). This variable is expected to positively affect the price of dwellings because - *ceteris paribus* - municipalities with a higher quantity of tourism-related amenities are expected to have higher house prices. Data on hospitality businesses come from tourism statistics of ISTAT and are provided yearly at the municipality level.

2) Nights of stay of tourists in formal tourist accommodation (*Nights of stay*). This variable represents the demand for formal accommodation at a municipality level. The increase in the local demand produces a pressure on house prices; given the supply, after the adjustments, the new equilibrium price tends to be higher. Data on nights of stay come from tourism statistics provided by ISTAT; yearly data at the provincial level are used, which is the most detailed geographical level available for this indicator.

3) Total revenues of museums (*Total Revenues of Museums*). This variable can be interpreted as a measure of the importance of cultural amenities in the destination. *Ceteris paribus* - municipalities with higher cultural amenities are expected to have higher house prices. This variable comes from the *Italian Ministry of Cultural Heritage* and is calculated by multiplying the number of sold tickets in public museums, monuments and archaeological areas by the ticket price; it is available at municipality level.

4) Second homes *(Second Homes)*. This variable represents a proxy for the quantity of homes owned by the non-resident population that are used as holiday homes. It can also be considered an indicator of the quantity of homes available for tourist rental. It is expected that as the demand for second homes increases, the price of all dwellings located in the municipality will increase. Unfortunately, ISTAT does not provide data on second homes owned or rented to tourists; the data available are the total number of dwellings not used for residential purpose by the resident population. This variable comes from Census data at a municipality level (year 2001).

Intentionally, and to facilitate the interpretation of the empirical results, the index contains a limited number of variables related to both the demand and supply of tourist accommodation.

The methodology used to construct the index is the Van der Waerden (VDW) ranking score, which is a type of fractional rank (FR) defined as:

$$VDW_{it} = {R_{it}}/{n+1} \tag{4.11}$$

where:
VDW_{it} is the Van der Waerden rank for city *i* at time *t*;
R_{it} is the rank of each provincial capital for each year.

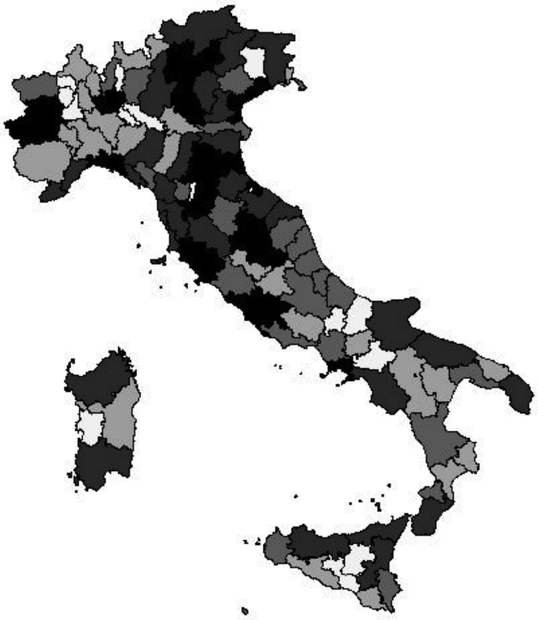
The VDW fractional rank is a simple way of standardizing scores so they range from 1/(n+1) to n/(n+1). High scores correspond a higher amount of tourist areas and vice versa. After computing the VDW index for each variable separately, the average of the four scores is calculated to obtain the final index of tourism for each city under analysis:

$$Tourism\ Index_{\ it} = \frac{\sum_{j=1}^{4} VDW_{ijt}}{4} \tag{4.12}$$

Map 4.2 shows the results of the index for the top ten tourist cities in 2007. As shown in the table, seven cities are distributed throughout the North (Venice, Verona, Turin, Milan, Florence, Ravenna, Rimini), two are located in the Centre (Perugia and Rome), and one is located in the South (Naples). Eight out of ten are art cities (Venice, Verona, Turin, Milan, Perugia, Rome and Naples), and five are located along the coast and represent the most popular tourist destinations in Italy (Venice, Ravenna, Rimini, Rome and Naples).

By comparing Maps 4.1 and 4.2, it is observed that areas with the highest house prices are concentrated in the northern part of the country while areas with high tourist orientation are geographically more widely spread.

Map 4.2 Tourism in Italian provincial capitals. Year 2007



Top ten provincial capitals for tourism vocation. Year 2007

Provinces	*Tourist Index*
1 Rome	0.98
2 Venice	0.94
3 Naples	0.92
4 Florence	0.92
5 Milan	0.88
6 Ravenna	0.88
7 Turin	0.88
8 Perugia	0.86
9 Rimini	0.81
10 Verona	0.81

Legenda

0.75 - 0.98
0.56 - 0.75
0.41 - 0.56
0.2 - 0.41
0.04 - 0.2

Note: higher score of the index corresponds to more tourist areas and vice versa. The ten less tourist provinces are: Lodi (0.04), Biella (0.07), Cremona (0.10), Avellino (0.11) Lecco (0.12), Vercelli (0.13), Enna (0.13), Pordenone (0.13), Campobasso (0.17), Caltanissetta (0.18).

Source: Author's elaboration on ISTAT data

4.5 The model

4.5.1 The general model

The present analysis adopts the inverted demand approach used in the housing literature (Mankiw and Weil, 1989; Muellbauer and Murphy, 1997; Stevenson, 2008). In particular, it is considered that all observations of prices and quantities are equilibrium values, and it is employed an inverted demand equation where house prices in a municipality *i* at time *t* depend on the stock of houses (*Q*), income per capita (*Y*), and demographic variables such as resident population (*P*). Mortgage rates and housing-related taxation are normally included as drivers of housing demand. However, because this analysis focuses on a set of Italian municipalities (103 provincial capitals), it is possible assume that local housing markets in Italy are subject to the same financial and taxation structure (European Central Bank, 2003).

Furthermore, in the present model, house price depends also on location-specific amenities/disamenities (A) (Do and Grudnitski, 1995; Luttik, 2000; Anderson and West, 2006; Nicholls and Crompton, 2007), and on tourism-related activities indicated with T (Biagi *et al.*, 2012; Cannari and Faiella, 2008).

Hence, house prices of the *i-th* municipality (for i= 1, 2, …103) at time t (for t= 1, 2,…12) can be formally expressed as:

$$HP_{it} = f(Q_{it}, Y_{it}, D_{it}, A_{it}, T_{it}) \quad (4.13)$$

where:
HP = real house prices per square meter
Q = house quantity (stock)
Y = local income per capita
D =demographic variables
A = amenities/disamenities
T = tourism-related activities (tourism index)

House prices are expected to be decreasing in Q (*i.e.,* as the price increases, the quantity of houses demanded at a local level decreases) and increasing in Y and D because municipalities with higher incomes and population are expected to be associated with higher house prices. Furthermore, house prices should be increasing in A for amenities (*i.e.*, as the level of public and private services supplied in the city increases, the price increases) and decreasing in A for disamenities (*i.e*., as the pollution, crime, congestion, and noise increase, the price decreases). Tourism related activities T are understood to affect house prices in two main ways: directly, via the "external" demand generated by visitors that "competes" with the local resident communities for land and housing; and indirectly, via the development of tourism-related amenities that affect the market price of all houses located in the city. As such, the tourism-house price relationship is expected to be positive - when tourism acts as a *boost* for the local economy - or negative - when the negative externalities that tourism activity generates predominate.

4.5.2 Empirical model

This study proposes a panel data approach to investigate the dynamics among tourism and house prices for 103 Italian municipalities (provincial capitals) over the time span of 1996-2007[96]. The empirical model is as follows:

$$Average\ House\ Price_{it} = \beta_0 + \beta_1 Tourism_{it} + \beta_2 Housing\ Stock_i + \beta_3 Crime_{it} + \beta_4 Ped\_Area_{it} + \beta_5 Coast_i + \beta_6 Gdp_{it} + \beta_7 Growth_{it} + \beta_8 Pop_{it} + \beta_9 Net\ Migration_{i,t-2} + \beta_{10} Death_{it} + \beta_{11} EURO_t + \beta_{12} Art_i + \beta_{13} Capital_i + \beta_{14} South_i + \beta_{15} Year_t + \eta_i + \varepsilon_{it} \quad (4.14)$$

A full description of the variables and several descriptive statistics are provided in Tables 4.3 and 4.4. The dependent variable is the annual average of house prices per square meters deflated by the Consumer Price Index (CPI) in level. It is also estimated the model for the house prices in the center, in the semi-center and in the outskirts. *Average House Price*$_{it}$ is the average real price of new housing per square meter in the *i-th* municipality for the time span of 1996-2007 (the nominal house price over the consumer price index[97]). As discussed previously, the price of new housing is used as a proxy for the average price of the existing stock of residential houses.

Tourism, the main variable of interest, is the index used to capture the tourism market at the destination site and described in the Subsection 4.4.2. The effect of tourism on the house markets is expected to be either positive or negative. In the former case tourism activity generates local economic growth (positive externality), in the latter case it creates negative externalities at the destination sites (congestion, crime, noise and so on).

Housing Stock is the number of new houses built in 1991. This variable represents a proxy for the local demand of housing; as such, it is expected a negative correlation with house prices. It is worth recalling that it is assumed the equilibrium price; therefore, the housing demand should be equal or close to the stock of houses in the cities under investigation.

Crime, Ped_Area, Coast and *Art* are all indicators of the amenities/disamenities in the investigated area. In particular, *Crime* is the total crime per capita and represents a local disamenity; *Ped_Area* indicates the size of pedestrian areas in the city (square meters per one hundred inhabitants). Usually

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[96] Despite the fact that the independent variable was available for a longer time span, the empirical analysis is conducted for the period of 1996-2007 due to the difficulty in finding data at a city level before 1996 for several of the main independent variables, particularly, the tourism-related variables.

[97] To determine whether tourism also affects the consumer price index (CPI), it is demonstrated that the tourism coefficient is not significant. This result indicates that tourism does not affect the average prices of goods provided in destinations and that it is possible to deflate house prices for CPI without incurring double computation, which would have biased the final results.

in Italian cities, the presence of pedestrian areas is associated with well-preserved historical spaces and distinctive neighborhoods; therefore, a positive sign is expected for this variable. *Coast* is a dummy variable that takes the value one if the municipality is located on the coast and zero otherwise. It is expected a positive sign for this variable. *Art* is another dummy variable that takes the value one if the city is an art-city and zero otherwise. Art-cities in Italy have a high-quality historic and cultural urban environment, and the expected sign is positive[98].

Gdp and *Growth* are, respectively, the average income of the resident population in level and in rate; variables are proxied with value-added per capita at real prices. Local income is expected to be positively correlated with property prices (Malpezzi, 1996; Leishman and Bramley, 2005; and Kajuth, 2010).

EURO is a dummy variable that controls for the introduction of the euro in 2002 and also for other legislative changes concerning the housing market that occurred specifically in Italy at the end of 2001 (abolition of inheritance tax on the 25th of October, 2001, and the suppression of the so-called INVIM, which is a tax on capital gains on the properties on the 28th of December 2001, Caliman, 2009). This variable is expected to be highly significant and positive.

Pop refers to the resident population and controls for the local demand of housing (Caliman, 2009). As also used in Leishman and Bramley (2005), the model controls for *Net Migration* (total number of in-migrants minus total number of out-migrants) and is expected to be positively correlated with house price.

Finally, *Death* is the total number of people who died over the living resident population.

Capital and *South* are dummy variables that control, respectively, whether the city is the capital of the region (Caliman, 2009) and whether is located in the Southern and poorer part of the country.

All variables are expressed in log-level terms; as such, the coefficients can be interpreted as elasticities. Finally, η_i and ε_{it} are the province fixed effect value and the error term, respectively; it is assumed that $E(\eta_i) = 0$, $E(\varepsilon_{it}\ \eta_i) = 0$ and $E(\varepsilon_{it}) = 0$.

[98] See Chapter 3 (footnote 68) for a detailed list of Italian art-cities.

Table 4.3 List of variables

Name	**Definition**	**Geographical scale**	**Period (years)**	**Type of variable**	**Source**
Average House Price	Average HP per square meter (center, semi-center and suburbs) deflated by the CPI	Provincial capital	1996-2007	Dependent	The Annuario Immobiliare
House Price in the Center	HP per square meter for all houses n the city center, deflated by the CPI	Provincial capital	1996-2007	Dependent	The Annuario Immobiliare
House Price in the Semi-Center	HP per square meter for all houses n the semi-center, deflated by the CPI	Provincial capital	1996-2007	Dependent	The Annuario Immobiliare
House Price in the Outskirt	HP per square meter for all houses n the outskirt, deflated by the CPI	Provincial capital	1996-2007	Dependent	The Annuario Immobiliare
Total Accommodation (Tourism)	Total number of accommodation	Provincial capital	1996-2007	In tourist index	ISTAT, Statistiche del turismo
Nights of Stay (Tourism)	Tourist nights of stay in the formal accommodation	Province	1996-2007	In tourist index	ISTAT, Statistiche del turismo
Total Revenues of Museums (Tourism)	Revenue in Euros of public museums tickets	Provincial capital	1996-2007	In tourist index	Ministry of cultural heritage
Second Homes (Tourism)	Total number of non-occupied houses[♣]	Provincial capital	2001	In tourist index	ISTAT, Population and Housing Census
Housing Stock	Total number of houses built after 1991	Provincial capital	2001	Housing	ISTAT Population and Housing Census
Crime	Total crime offences per 100,000 inhabitants	Provincial capital	1996-2007	Amenities	ISTAT Statistiche Giudiziarie Penali
Ped_Areas	Pedestrian areas square meters per 100 inhabitants	Provincial capital	1996-2007	Amenities	ISTAT, Indicatori ambientali urbani
Coast	Dummy variable. Values=1 if the municipality is located on the coast and zero otherwise	Provincial capital	time invariant	Amenities	Author's elaboration on ISTAT
Gdp	Value added per capita at real price (base year 1995)	Province	1996-2007	Economic	Author's elaboration on ISTAT and Tagliacarne Institute.
Growth	Growth rate of value added per capita at real prices	Provincial capital	1996-2007	Economic	Author's elaboration on ISTAT and Tagliacarne Institute.
Pop	Resident population	Provincial capital	1996-2007	Demographic	ISTAT
Net Migration	Total number of in-migrants minus total number of out-migrants	Provincial capital	1996-2007	Demographic	ISTAT, Atlante statistico dei comuni

[♣] This is a proxy for holiday homes; data for holiday homes are only available at the 1991 Census, where holiday homes are classed as a type of unoccupied housing (non-permanent residency).

Death	Total number of death over the resident population	Provincial capital	1996-2007	Demographic	ISTAT, Atlante statistico dei comuni
EURO	Dummy variable. Values=1 after 2002 and zero otherwise	Provincial capital		Dummy	Author's elaboration
Art	Dummy variable. Values=1 if the province is an art city and zero otherwise	Provincial capital	time invariant	Dummy	Istituto Geografico D'Agostini
Capital	Dummy variable. Values=1 if the municipality is a Regional Capital and zero otherwise	Provincial capital	time invariant	Dummy	ISTAT
South	Dummy variable. Values=1 if the municipality is located in the south and zero otherwise	Provincial capital	time invariant	Dummy	Author's elaboration

Source: Author's elaboration

Table 4.4 Descriptive statistics of variables

Name	**Mean**	**SD**	**Min**	**Max**
Average House Price, (Euros per square meter)	7.67	0.43	6.63	9.22
House Price in the Center, (Euros per square meter)	7.91	0.46	6.67	9.67
House Price in the Semi-Center, (Euros per square meter)	7.63	0.43	6.50	9.13
House Price in the Outskirt, (Euros per square meter)	7.39	0.41	6.21	9.95
Tourism, (composite index)	-0.83	0.59	-3.39	-0.02
Housing Stock, (total number)	7.81	0.82	4.97	10.73
Crime, (per 100,000 population)	9.59	0.44	7.82	10.81
Ped_Areas, (per 100 population)	1.72	2.60	-4.61	6.15
Coast, (dummy)	0.36	0.48	0.00	1.00
Gdp, (real Gdp per capita)	11.39	0.55	9.83	12.84
Growth, (per capita)	0.06	0.03	-0.38	0.44
Pop (total number)	11.49	0.85	9.95	14.82
Net Migration (total number)	3.13	3.10	0.00	10.48
Death (per capita)	-4.60	0.21	-5.27	-4.10
EURO (dummy)	0.50	0.50	0.00	1.00
Art (dummy)	0.31	0.46	0.00	1.00
Capital (dummy)	0.19	0.40	0.00	1.00
South (dummy)	0.35	0.48	0.00	1.00

Notes: all variables are in log.
Source: Author's elaboration

4.6 The methodology

As described above, the main purpose of the present work is to analyze whether tourism activity (tourism market) affects urban house price dynamics.

Data consist of yearly observations of average house prices in 103 Italian cities over the period of 1996-2007.

From a methodological point of view, the key issue at this stage is selecting the most suitable estimator; this crucial choice can be performed only after having addressed various steps. First, possible persistency in house prices that might affect their temporal dynamics should be explored. In other words, it is imperative to investigate whether actual prices are correlated with past prices (serial correlation). Literature on housing shows that house price series are persistent over time (Browing *et al.*, 2008; Demary, 2009; Sadeghi *et al.*, 2012), meaning that the level of house prices at time *t* depends strongly on the house prices at time *t-1*. Therefore, the analysis of the static model is needed to control for serial correlation in the idiosyncratic error term. Hence, it is performed the Wooldridge test (Wooldridge, 2002)[99] for serial correlation after regressing random, fixed and between panel OLS. Serial correlation in the residuals was confirmed[100].

The following step is to check whether house prices are stationary or if they have unit roots (α=1)[101]. As explained by Browing *et al.* (2008), the presence of unit roots would indicate that possible shocks to the housing prices are permanent; in this case, using OLS for estimating the present model would provide efficient estimates. Conversely, if the process were stationary, the use of OLS would give biased results. A series of panel unit root tests are then performed to check the stationarity of the dependent variable (Levin *et al.,* 2002; Im *et al.*, 2003; Maddala and Wu, 1999). The obtained results confirm the stationarity of the house price series for the time span under analysis (Table 4.5).

Table 4.5 Unit Root tests

Variable	***Levin-Lin-Chu***	***Im-Pesaran-Shin***	***Augmented Dickey-Fuller***
	P-value	P-value	P-value
Real house price (average)	0.0000	0.0001	0.0000
Real house price (center)	0.0000	0.0000	0.0000
Real house price (semi-center)	0.0000	0.0000	0.0000
Real house price (outskirt)	0.0000	0.0000	0.0000
Time trend	Included	Included	Included
Number of panels	103	103	103
Number of periods	12	12	12

Note: Levin-Lin-Chu H_0: Panels contain unit roots; Im-Pesaran-Shin H_0: All panel contain unit roots; Augmented Dickey-Fuller H_0: Unit roots.

[99] See Chapter 3 (Subsection 3.5.3) for more details about the Wooldridge test and serial correlation in panel data.

[100] Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1,102)=106.51
Prob > F = 0.0000

[101] See Chapter 3 (Subsection 3.5.3) for an exhaustive explanation of stationarity, unit root and main tests.

Both Wooldridge and unit root tests results indicate that using OLS would give biased results. A further element that makes OLS an unsuitable estimator for the purpose of the present analysis is the possibility that some - or even all - explanatory variables are endogenous. In dynamic models, when the process is stationary and the independent variables are not strictly exogenous, the literature suggests using GMM, which is considered the most efficient and unbiased estimator for such cases (Baum, 2006; Roodman, 2009). GMM allows economic models to be specified, thus avoiding unnecessary assumptions, such as, for instance, specifying a particular distribution for the errors (Greene, 2007)[102].

After choosing the estimator based on the criteria outlined above, a further and necessary step is to decide which type of GMM is suitable for the case under analysis. In short, it is determined whether it is better to perform a GMM in the difference or in the system form (GMM-DIFF or GMM-SYS). In the present model, it is also critical to control for time invariant dummies. This possibility is allowed only by the system version of GMM (see also Caliman, 2009). Additionally, following Roodman (2009), GMM-SYS was designed for cases with small panel data sets, when, among others: a) the number of the observations is greater than the time periods *(n>t)*; b) the functional relationship is linear; c) the model is dynamic; and d) the independent variables are not strictly exogenous. In addition, for small samples, Blundell *et al.* (2000) suggest the use of one-step GMM-SYS, as the two-step procedure is asymptotically more efficient (*i.e.*, it is more efficient for large samples). In the one-step estimate, the model consists of a system of equations - as many as the *t* under analysis. In each equation, the endogenous variables in level are instrumented using lags of their first difference.

In this empirical application, the number of observations (*n*=103) is higher than the time period (*t*=12), the dynamic among the dependent and the independent is supposed to be linear; the independent variables (all except the dummies) are expected to be correlated with their past and with the error, and time-invariant dummies need to be controlled. Given all those characteristics, GMM-SYS is the preferred form and the dynamic version of model (4.14) becomes:

$$Average\ House\ Price_{it} = \beta_0 + \beta_1 House\ Price_{i,t-1} + \beta_2 Tourism_{it} + \beta_3 Housing\ Stock_i + \beta_4 Crime_{it} + \beta_5 Ped\_Area_{it} + \beta_6 Coast_i + \beta_7 Gdp_{it} + \beta_8 Growth_{it} + \beta_9 Pop_{it} + \beta_{10} Net\ Migration_{i,t-2} + \beta_{11} Death_{i,t} + \beta_{12} EURO_t + \beta_{13} Art_i + \beta_{14} Capital_i + \beta_{15} South_i + \beta_{16} Year_t + \eta_i + \varepsilon_{i,t} \qquad (4.15)$$

The GMM approach has been recently applied in empirical studies on the determinants of house prices: Browning *et al.* (2008) use a GMM-SYS to analyze 275 Danish municipalities during the time span of 1985-2001 (4,675 total

[102] For an extensive description of GMM see Chapter 3 (Subsection 3.5.3) and footnote 51 for the command used in STATA 12 in order to perform the method.

observations), Kajuth (2010) performs a GMM to investigate German house prices for the time span of 1975-2008, Wang *et al.* (2012) apply a micro panel of 8,134 Chinese households for the time span of 2000-2006, and Sadeghi *et al.* (2012) employ a GMM to examine housing price determinants in three cities of Iran for 32 years (96 total observations). For the purposes of the present analysis, the work of Caliman (2009) is particularly relevant as it applies a GMM-SYS to investigate the house price dynamics of a panel of 103 Italian provinces[103] over the period of 1995-2003. The author uses the same data source of the present work but at a more aggregate level (provinces rather than municipalities). The econometric properties of the panel under analysis are almost the same, and the author concludes that the GMM-SYS is the most suitable estimator.

4.7 Results

Table 4.6 illustrates the results of System GMM estimates[104]. Using variables in logs allows interpreting coefficients as elasticities. As demonstrated from the table, the coefficient of the lagged response variable ($Average\ House\ Prices_{i,t-1}$) is positive and highly significant, indicating strong persistence in the series of house prices: the value of 0.49 means that if house prices at time *t-1* increase by 1%, the house prices at time *t* will increase by 0.5%. The persistency is also confirmed in previous work on the Italian housing market. In particular, Caliman (2009) uses a GMM-SYS to investigate a panel of Italian provinces over the period of 1995-2003. The author finds a coefficient of 0.89, which is significantly higher than that determined in the present work. However, in a more recent analysis Caliman and Di Bella (2011), using a time span very similar to that used in the present analysis (1995-2008), find a coefficient equal to 0.48; this outcome definitively confirms the robustness of the present result. In the case of other countries, it is worth noting that recent GMM applications confirm the persistency of house prices (for instance Browning *et al.*, 2008 for the Danish housing market; Yu, 2010 for a panel of Chinese cities). In table 4.6 (see columns 2, 3 and 4), it is worth noting that the persistency of house prices increases for dwellings located in the center and decreases for those sited in the semi-center and the outskirts.

The main variable of interest, *Tourism,* is confirmed to be highly significant and positively correlated to house prices: this means that - *ceteris paribus* - places characterized by higher tourism vocation exhibit higher house prices. Specifically, on average if the tourism index increases by 1%, house prices rise by 0.2%. This

[103] Italian provinces correspond to the US counties (see footnote 90).
[104] The Arellano Bond test (1991) indicates that residuals are not serially correlated; the Sargan (1958) and Hansen (1982) tests for the joint validity of the instruments gives inconclusive results; however, as Bowsher (2002) clearly explains, the last two tests are found to have no power in panels of small dimensions.

result is in line with findings of Biagi *et al.* (2012) – where a similar index is employed in the case of Sardinia – as well as findings of Cannari and Faiella (2008) – where the analysis of a sample of Italian municipalities derives similar results. This positive link needs to be interpreted cautiously because cities in Italy differ significantly as tourism destinations; in addition, another source of caution in the interpretation of this result is the fact that tourism is just one of the various economic activities in cities that generate local growth and hence can explain higher house prices. Notwithstanding, the outcome is very interesting and can be interpreted as a sign that tourism activity activates and increases housing demand and supply at the destination site, but also that the presence of tourism amenities generates positive externalities on house prices. As such, on the one hand, this outcome can be considered "good news" for cities: tourism specialization in Italy, on average, would represent a positive externality and a supplementary way to boost local economies and local housing markets. On the other hand, the pressure on house prices due to the external housing demand generated by tourists, holiday home/second home owners, retirees and tourist (seasonal) working population, might create problems of affordability and displacement for local communities. Furthermore, tourism specialization might create other negative effects such as, for instance, congestion, crime and noise. Additionally, it is likely that as house prices increase, additional costs are imposed on the resident population due to the rise of property taxes. It is worth recalling that the sample under analysis is characterized by a large variety of cities; hence, this final result can be driven by the role played by several cities or a group of similar cities.

The next section is devoted in demonstrating the robustness of this result and in discussing the effect of tourism for cities with different characteristics. Table 4.6, in particular columns 2 and 3, suggest that the impact of tourism is higher on average for housing located in central and semi-central locations.

Table 4.6 GMM-SYS: results

MODELS *VARIABLES*	(1) *Average House Prices (per meter²)*	(2) *House Prices in the Centre (per meter²)*	(3) *House Price in the Semi-Centre (per meter²)*	(4) *House Prices in the Outskirt (per meter²)*
Average House Prices$_{t-1}$	0.49***			
	(0.048)			
House Prices in the Centre $_{t-1}$		0.53***		
		(0.048)		
House Prices in the Semi-Centre $_{t-1}$			0.37***	
			(0.047)	
House Prices in the Outskirt $_{t-1}$				0.34***
				(0.053)
Tourism$_{i,t}$	0.20**	0.21*	0.21**	0.14**
	(0.082)	(0.11)	(0.083)	(0.057)
Housing Stock$_t$	0.00100	-0.012	0.017	0.011
	(0.025)	(0.026)	(0.033)	(0.030)
Crime$_{i,t}$	-0.035	-0.035	-0.072**	-0.011
	(0.022)	(0.026)	(0.035)	(0.032)
Ped_Areas$_{i,t}$	0.0058	0.0078	0.0053	0.0044
	(0.0057)	(0.0055)	(0.0073)	(0.0047)
Coast$_i$	0.017	0.027	0.019	-0.015
	(0.044)	(0.044)	(0.053)	(0.054)
Gdp$_{,t}$	0.16***	0.14***	0.18***	0.17***
	(0.042)	(0.040)	(0.044)	(0.061)
Growth$_{i,t}$	0.17	0.073	-0.037	0.33*
	(0.17)	(0.20)	(0.18)	(0.18)
Pop$_{i,t}$	0.56**	0.40	0.30	0.80**
	(0.26)	(0.27)	(0.24)	(0.34)
Net Migration $_{t-2}$	-0.00075	-0.0013	-0.00084	-0.00090
	(0.0015)	(0.0018)	(0.0019)	(0.0019)
Death$_{i,t}$	0.061	0.023	0.069	0.063
	(0.070)	(0.062)	(0.068)	(0.10)
EURO$_t$	0.17***	0.15***	0.22***	0.25***
	(0.035)	(0.036)	(0.042)	(0.035)
Art$_i$	0.013	0.021	-0.038	0.053
	(0.053)	(0.050)	(0.060)	(0.064)
Capital$_i$	0.057	0.054	0.045	0.071
	(0.058)	(0.061)	(0.065)	(0.076)
South$_i$	-0.063	-0.066	-0.073	-0.15***
	(0.047)	(0.049)	(0.058)	(0.058)
Constant	0.94	0.93	1.65*	1.60*
	(0.68)	(0.79)	(0.85)	(0.84)
Observations	927	927	927	927
Number of capital provinces	103	103	103	103
Arellano-Bond[1]	0.990	0.126	0.294	0.713
Sargan test[2]	0.897	0.496	1.000	0.917
Hansen test[2]	1.000	1.000	1.000	1.000

Notes: Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. All variables are in log.
[1]Arellano-Bond (1991) statistic test under the null hypothesis of no second-order autocorrelation in the residuals.
[2] Sargan (1958) and Hansen (1982) statistic tests under the null hypothesis of the joint validity of the instruments.

Regarding amenities/disamenities, *Crime* is significant at 5% only for properties located in the semi-center and has the anticipated negative sign: if total crime per capita increases by 1%, house prices will decrease almost by the same percentage (0.7%). It is likely that the focus of criminal activity is the semi-center rather than the center because in the semi-center, the properties have still high values, but the security is normally less than those normally employed in the city center. *Ped_Area* and *Coast* are not significant; however, it is worth noting that only 36% of cities in the sample are located on the coast[105].

As emphasized in the housing literature (Malpezzi, 1996; Kajuth, 2010; Caliman and Di Bella, 2011; and Sadeghi *et al.*, 2012), *Gdp* has a strong positive effect, which means that in wealthy cities, the equilibrium house prices are relatively higher due to the structural quality and quantity of the housing investment. The variable *Growth* is positive and significant at 10% but only for houses located in the outskirts.

Pop is observed to have a very high impact on house prices even though it is significant at 5%[106]. Caliman and Di Bella (2011) strongly emphasize that this variable represents a further proxy for housing demand or potential buyers. *Net Migration* is not significant, which is most likely because it is used net migration rather than in-migration and outmigration separately. The attended sign was positive rather than negative; however, Leishman and Bromley (2005) analyze housing price in a sample of British districts and observe that in-migration is significant and negatively correlated with house price, while the sign and significance of out-migration is uncertain.

Among the dummy variables, *EURO* is strongly significant (1%) and has the expected positive sign: the introduction of a single currency in the EU generates a revaluation effect on property values in Europe as a whole and in Italy in particular (see also Caliman and Di Bella, 2011). Additionally, it is very likely that the abolition of both inheritance tax and taxes on capital gains on properties, which occurred in Italy in 2001, has reduced housing costs and caused an increase in housing demand and, consequently, the equilibrium prices. Regarding the other dummy variables, the only other significant one is *South* (1%); as expected, the sign is negative meaning that houses located in the poorer part of the country (the South) have relatively lower prices. This result represents a further confirmation of the effect of local wealth and GDP on house prices.

Finally, the *Housing Stock* variable is not significant; this could most likely indicate a problem with the proxy variably on the total housing stock (which was only available for 1991) due to the lack of stock data for a longer period of time.

[105] Results do not change considering other geographical control variables such as altimetry.
[106] Results do not change considering other demographic variables such as density of population.

4.7.1 Robustness checks

This section illustrates the outcomes of a series of robustness tests implemented to check the sensitivity of the obtained results. Three types of robustness tests are performed:

1) The first type concerns the sensitivity of the already-created index (see Table 4.7).
2) The second type of test examines the possibility that different regimes of the tourism-house prices relationship occur for different types of cities or groups of cities (see Table 4.8).
3) The third type investigates whether the effect of the tourism index changes when the tourism indicators in the composite index are all adjusted for population (per 1,000 inhabitants) in addition to whether for this new index, different types of regimes are confirmed (see Table 4.9).

The first step introduces one tourism variable at a time in the final model of Table 4.6 where the dependent variable is *Average House Prices*. As shown in Table 4.7 (columns 1, 2, 3, 4), only the variable representing total accommodation has a positive attended sign, and none of the variables are significant. This outcome confirms the complexity of the tourism market and the importance to capture this complexity by means of a composite index. The role of other explanatory variables in the housing market is confirmed because the significance and the signs remain almost unaltered.

Table 4.7 GMM-SYS: results of the first robust check

MODELS **VARIABLES**	**(1)** ***Average House Prices (per meter^2)***	**(2)** ***Average House Prices (per meter^2)***	**(3)** ***Average House Prices (per meter^2)***	**(4)** ***Average House Prices (per meter^2)***	**(5)** ***Average House Prices (per meter^2)***
Average House Prices$_{t-1}$	0.43***	0.45***	0.47***	0.48***	0.49***
	(0.055)	(0.057)	(0.050)	(0.053)	(0.048)
Total Accomodation$_{i,t}$	0.0097				
	(0.018)				
Nights of Stay$_{i,t}$		-0.018			
		(0.030)			
Total Revenues of Museums$_{i,t}$			-0.0025		
			(0.0041)		
Second Homes$_i$				-0.055	
				(0.044)	
Tourism$_{i,t}$					0.20**
					(0.082)
Housing Stock$_t$	-0.042	-0.023	0.012	0.0095	0.00100
	(0.029)	(0.030)	(0.024)	(0.027)	(0.025)
Crime$_{i,t}$	-0.037	-0.050*	-0.034	-0.019	-0.035
	(0.026)	(0.027)	(0.025)	(0.029)	(0.022)
Ped_Areas$_{,i,t}$	-0.00090	-0.00026	0.0034	-0.00039	0.0058
	(0.0072)	(0.0075)	(0.0076)	(0.0082)	(0.0057)
Coast$_i$	-0.028	-0.041	0.038	0.039	0.017
	(0.046)	(0.049)	(0.045)	(0.052)	(0.044)
Gdp$_{i,t}$	0.19***	0.18***	0.17***	0.18***	0.16***
	(0.053)	(0.061)	(0.049)	(0.053)	(0.042)
Growth$_{i,t}$	0.13	0.14	-0.018	0.16	0.17
	(0.16)	(0.16)	(0.15)	(0.16)	(0.17)
Pop$_{i,t}$	0.50*	0.58**	0.48*	0.64**	0.56**
	(0.27)	(0.29)	(0.27)	(0.29)	(0.26)
Net Migration$_{t-2}$	-0.00036	0.00030	-0.000061	-0.00036	-0.00075
	(0.0016)	(0.0015)	(0.0014)	(0.0015)	(0.0015)
Death$_{i,t}$	-0.0069	0.063	0.098	0.069	0.061
	(0.069)	(0.073)	(0.094)	(0.080)	(0.070)
EURO$_t$	0.18***	0.18***	0.15***	0.16***	0.17***
	(0.035)	(0.037)	(0.038)	(0.036)	(0.035)
Art$_i$	-0.0040	0.0013	0.053	0.034	0.013
	(0.051)	(0.060)	(0.061)	(0.053)	(0.053)
Capital$_i$	0.085	0.013	0.018	0.034	0.057
	(0.055)	(0.057)	(0.061)	(0.058)	(0.058)
South$_i$	-0.031	0.0019	-0.037	-0.042	-0.063
	(0.050)	(0.044)	(0.049)	(0.046)	(0.047)
Constant	0.91	0.70	1.16	0.65	0.94
	(0.71)	(0.89)	(0.78)	(0.80)	(0.68)
Observations	927	927	927	927	927
Number of capital provinces	103	103	103	103	103

Notes: Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. All variables are in log.

The second step investigates the existence of different potential tourism-house price relationships for groups/types of cities. The clusters of cities are based on the Caliman (2008; 2009) recent works on house prices in Italian provinces. The author uses a cluster analysis to define ten groups of cities according to house prices. For simplicity, the present work uses the same clusters found by Caliman (2009) and divided in the following manner:

- 1: Milan, Venice, Rome and Naples. They are large cities characterized by very similar quotations of house price per square meter and also by the fact that are the most historic cities in Italy (Caliman, 2009);
- 2: Turin, Aosta, Bergamo, Brescia, Lecco, Como, Trento, Treviso, Vicenza and Padua). These are all medium-sized rich provinces located in the North of Italy;
- 3: Alessandria, Asti, Novara, Vercelli, Pavia and Varese. They are medium-sized provinces with an older demographic structure and less economic dynamism than cluster 2.
- 4: Ferrara, Forlì, and Ravenna. In the region of Emilia Romagna, 3 main clusters of cities in terms of housing sub-markets are observed (3-4 and 5);
- 5: Bologna, Modena and Reggio Emilia;
- 6: Parma and Piacenza.
- 7: Messina and Palermo. Sicily is divided into two clusters (7 and 8)
- 8. Caltanissetta, Enna, Ragusa, Siracusa and Trapani.
- 9: Oristano and Nuoro: Sardinian cities with low house prices.
- 10: L'Aquila, Chieti, Latina, Frosinone, Campobasso, Caserta, Avellino, Potenza, and Matera. The last cluster is represented by provinces of different southern regions but characterized by lagging economies.[107]

[107] For further information about these clusters, see Caliman (2008) and Caliman and Di Bella (2011).

Table 4.8 GMM-SYS: results of the second robust check

CLUSTERS **VARIABLES**	***(1)*** ***Average House Prices (per meter^2)***	***(2)*** ***Average House Prices (per meter^2)***	***(3)*** ***Average House Prices (per meter^2)***	***(4)*** ***Average House Prices (per meter^2)***	***(5)*** ***Average House Prices (per meter^2)***	***(6)*** ***Average House Prices (per meter^2)***	***(7)*** ***Average House Prices (per meter^2)***	***(8)*** ***Average House Prices (per meter^2)***	***(9)*** ***Average House Prices (per meter^2)***	***(10)*** ***Average House Prices (per meter^2)***
Average House Prices$_{t-1}$	-0.58***	0.56***	0.49***	0.12	-0.23	0.71***	1.14***	0.55***	1.09***	0.61***
	(0.21)	(0.080)	(0.15)	(0.16)	(0.31)	(0.17)	(7.9e-07)	(0.15)	(2.2e-08)	(0.13)
Tourism$_{i,t}$	-0.45	-0.035	0.12	1.91***	1.24***	0.44	0.68***	0.042	-0.16***	0.11**
	(2.69)	(0.10)	(0.085)	(0.40)	(0.29)	(0.27)	(8.3e-07)	(0.25)	(2.0e-09)	(0.053)
Housing Stock$_t$	-0.016	-0.0074	0.38***	-0.82***	0.89***	-1.07***	1.04***	-0.52**	0	0.023
	(0.14)	(0.0061)	(0.065)	(0.29)	(0.038)	(0.25)	(3.0e-06)	(0.25)	(0)	(0.062)
Crime$_{i,t}$	-0.42***	0.056	0.31***	0.052	-0.55***	-0.16	-0.26***	-0.39***	0.048***	0.084
	(0.16)	(0.063)	(0.068)	(0.073)	(0.069)	(0.36)	(1.1e-06)	(0.10)	(5.7e-10)	(0.053)
Ped_Areas$_{i,t}$	0.11**	-0.0058	0.023***	-0.036	-0.55***	-0.31**	0.058***	0.010**	-0.0099***	0.0029
	(0.056)	(0.0058)	(0.0035)	(0.060)	(0.13)	(0.14)	(7.8e-09)	(0.0043)	(1.1e-10)	(0.0019)
Gdp$_{i,t}$	0.56	0.012	-0.28**	0.31**	2.98***	-0.23	-0.76***	0.50	-1.20***	-0.12
	(0.51)	(0.038)	(0.12)	(0.14)	(0.35)	(0.85)	(2.4e-06)	(0.35)	(3.8e-08)	(0.087)
Growth$_{i,t}$	-2.74***	0.39	0.57*	-1.24***	-4.42***	-0.43	-0.42***	-0.71**	-0.45***	0.14
	(0.68)	(0.24)	(0.30)	(0.35)	(0.61)	(2.14)	(4.7e-06)	(0.36)	(6.1e-09)	(0.19)
Pop$_{i,t}$	-3.88*	-0.026	0.35	0.72	-3.27***	0.99***	14.0***	0.81	-2.41***	-0.38
	(2.30)	(1.06)	(0.73)	(0.53)	(0.48)	(0.38)	(9.5e-06)	(1.86)	(4.3e-08)	(0.44)
Net Migration $_{t-2}$	-0.0033	-0.00083	0.0043	0.0071***	-0.0092	-0.018		-0.0026	0.0049***	-0.0022
	(0.0021)	(0.0021)	(0.0028)	(0.00045)	(0.010)	(0.012)		(0.0032)	(3.3e-10)	(0.0022)
Death$_{i,t}$	0.33	-0.061	0.47***	0.81***	0.47***	-0.64	-1.02***	-0.16	-0.53***	-0.013
	(0.43)	(0.10)	(0.12)	(0.10)	(0.16)	(0.43)	(2.7e-06)	(0.21)	(1.6e-09)	(0.050)
EURO$_t$	0.68***	0.20***	0.15**	0.035	0.050	0.21***	0.29***	0.17***	0.35***	0.20**
	(0.12)	(0.044)	(0.071)	(0.12)	(0.28)	(0.077)	(1.2e-06)	(0.059)	(4.3e-09)	(0.078)
Constant	-0.14	2.63***	7.88**	10.5***	-22.5***	0	0	0.51	24.8***	3.05***
	(9.21)	(0.79)	(3.16)	(0.87)	(8.48)	(0)	(0)	(7.52)	(8.0e-07)	(0.78)
Observations	36	90	54	27	27	18	18	45	18	81
Number of capital provinces	4	10	6	3	3	2	2	5	2	9

Notes: Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. All variables are in log.

Table 4.8 bis GMM-SYS: results of the second robust check

Cluster	*Cities*	*Sign*	*Significance*
1	Milan, Venice, Rome, Naples	Negative	
2	Turin, Aosta, Como, Bergamo, Brescia, Lecco, Trento, Treviso, Vicenza, Padua	Negative	
3	Vercelli, Novara, Asti, Alessandria, Varese, Pavia	Positive	
4	Ferrara, Ravenna, Forlì	Positive	1%
5	Reggio Emilia, Modena, Bologna	Positive	1%
6	Piacenza, Parma	Positive	
7	Palermo, Messina	Positive	1%
8	Enna, Ragusa, Siracusa, Caltanissetta, Trapani	Positive	
9	Oristano, Nuoro	Negative	1%
10	L'Aquila, Chieti, Latina, Frosinone, Campobasso, Caserta, Avellino, Potenza, Matera	Positive	5%
No cluster	103 Italian provincial capitals	Positive	5%

Source: Author's elaboration

As shown in Table 4.7, in five out of ten clusters, the tourism-house price relationship is highly significant; however, this variable is positive for clusters 4-5-7 and 10. Among these clusters, a stronger coefficient is determined for cluster 4 (cities located in the region of Emilia Romagna). It is worth noting that among the Italian regions, Emilia Romagna is the one where tourism contributes the most to the GDP (see Caliman, 2008) and is also ranked first for tourism arrivals (Paci and Marrocu, 2013).

Interestingly, in large cities (cluster 1) the relationship is not significant and has a negative sign. It is likely that the tourism presence in such cases can represent a source of negative externality for house prices most likely through the increase of criminal activity (see Chapter 3 of the present dissertation), noise, congestion and other negative effects.

In summary, this second check provides several hints of the presence of different regimes in the tourism-house price relationship.

The third step considers whether the effect of the tourism on house prices changes when the tourism indicators in the composite index are all adjusted for population (per 1,000 inhabitants). As shown in Table 4.8, the presence of different regimes is confirmed.

The robustness checks overall corroborate the tourism-house price relationship. In addition, they also stress the importance for extending the present work in to further explore whether –and to what extent – this relationship varies according to the type of city (or group of cities). This further analysis requires the use of other types of estimators such as, for instance, the mixture models (McLachlan and Basford, 1988).

Table 4.9 GMM-SYS: results of the third robust check

CLUSTERS VARIABLES	***(1) Average House Prices (per meter^2)***	***(2) Average House Prices (per meter^2)***	***(3) Average House Prices (per meter^2)***	***(4) Average House Prices (per meter^2)***	***(5) Average House Prices (per meter^2)***	***(6) Average House Prices (per meter^2)***	***(7) Average House Prices (per meter^2)***	***(8) Average House Prices (per meter^2)***	***(9) Average House Prices (per meter^2)***	***(10) Average House Prices (per meter^2)***
Average House Prices$_{t-1}$	-0.46***	0.54***	0.65***	0.17	-0.32	0.63***	3.69***	0.54***	0.56***	0.53***
	(0.058)	(0.086)	(0.13)	(0.18)	(0.23)	(2.4e-10)	(5.9e-07)	(0.12)	(3.1e-09)	(0.14)
Tourism/Pop$_{i,t}$	-0.44***	-0.094	-0.022	0.12***	1.29***	1.68***	8.77***	-0.29**	0.060***	-0.047
	(0.15)	(0.10)	(0.096)	(0.041)	(0.40)	(5.5e-09)	(9.8e-07)	(0.13)	(1.7e-08)	(0.14)
Housing Stock$_t$	0.20***	-0.0053	0.28***	0.19***	-1.30***	-0.38***	12.3***	0.015	-2.18***	0.047
	(0.055)	(0.0064)	(0.062)	(0.030)	(0.27)	(7.1e-09)	(1.5e-06)	(0.032)	(8.9e-08)	(0.045)
Crime$_{i,t}$	-0.17*	0.087	0.34***	0.12	-1.15***	0.39***	-13.0***	-0.44***	0.14***	0.085
	(0.097)	(0.057)	(0.10)	(0.10)	(0.057)	(2.2e-09)	(1.5e-06)	(0.10)	(1.3e-09)	(0.052)
Ped_Areas$_{i,t}$	0.14***	-0.0036	0.021***	0.055	-0.47***	-0.42***	0.36***	0.0079*	-0.019***	0.0022
	(0.035)	(0.0073)	(0.0054)	(0.038)	(0.11)	(7.9e-10)	(4.7e-08)	(0.0044)	(1.6e-10)	(0.0034)
Gdp$_{i,t}$	0.35**	-0.017	-0.26***	0.72**	-1.11***	-1.62***	5.34***	0.57***	-0.39***	-0.099
	(0.15)	(0.045)	(0.039)	(0.33)	(0.22)	(6.1e-09)	(2.6e-07)	(0.19)	(4.9e-09)	(0.10)
Growth$_{i,t}$	-1.31***	0.45*	0.46	-0.96***	2.39**	1.79***	-48.6***	-0.71***	0.67***	0.090
	(0.26)	(0.27)	(0.38)	(0.072)	(1.00)	(1.2e-08)	(5.3e-06)	(0.24)	(5.9e-09)	(0.21)
Net Migration $_{t-2}$	-0.0082**	-0.0016	0.0027	0.011	-0.031***	-0.026***		-0.0011	-0.011***	-0.00051
	(0.0039)	(0.0023)	(0.0021)	(0.0066)	(0.0073)	(6.0e-11)		(0.0030)	(2.1e-10)	(0.0026)
Death$_{i,t}$	0.27	-0.10	0.45***	0.53***	0.17	-0.45***	22.0***	-0.21***	-0.70***	0.034
	(0.37)	(0.11)	(0.16)	(0.039)	(0.32)	(2.0e-09)	(2.4e-06)	(0.080)	(4.3e-09)	(0.069)
EURO$_t$	0.71***	0.22***	0.034	-0.059*	1.63***	0.39***	-10.3***	0.18**	0.26***	0.22***
	(0.055)	(0.053)	(0.032)	(0.031)	(0.22)	(6.9e-10)	(1.1e-06)	(0.081)	(9.6e-10)	(0.068)
Constant	0.88	2.39**	3.29**	1.57	52.2***	19.0***	0	2.38	18.9***	4.10***
	(2.70)	(1.02)	(1.28)	(2.68)	(4.31)	(9.0e-08)	(0)	(1.72)	(5.8e-07)	(1.55)
Observations	36	90	54	27	27	18	18	45	18	81
Number of capital provinces	4	10	6	3	3	2	2	5	2	9

Notes: Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. All variables are in log.

Table 4.9 bis GMM-SYS: results of the third robust check

Cluster	*Cities*	*Sign*	*Significance*
1	Milan, Venice, Rome, Naples	Negative	1%
2	Turin, Aosta, Como, Bergamo, Brescia, Lecco, Trento, Treviso, Vicenza, Padua	Negative	
3	Vercelli, Novara, Asti, Alessandria, Varese, Pavia	Negative	
4	Ferrara, Ravenna, Forlì	Positive	1%
5	Reggio Emilia, Modena, Bologna	Positive	1%
6	Piacenza, Parma	Positive	1%
7	Palermo, Messina	Positive	1%
8	Enna, Ragusa, Siracusa, Caltanissetta, Trapani	Negative	5%
9	Oristano, Nuoro	Positive	1%
10	L'Aquila, Chieti, Latina, Frosinone, Campobasso, Caserta, Avellino, Potenza, Matera	Negative	
No cluster	103 Italian provincial capitals	Positive	

Source: Author's elaboration

4.8 Concluding remarks and policy implications

Despite the fact that the role of tourism on local economic growth is widely investigated in the current tourism literature, the effect of tourism on the housing market has been understudied. The majority of existing research is based on US evidence and performs cross-section analysis neglecting the possible dynamics of the tourism–house price relationship. Contrariwise, knowing the average effect of tourism on the housing market at the destination sites is crucial for urban policies and requires careful monitoring. On the one hand, a positive linkage between tourism and house prices can be considered a supplementary way to boost local economies; however, it can generate socio-economic problems of affordability and displacement of the resident population. On the other hand, a negative relationship can be considered as an indication that the presence of tourism activity generates some sort of negative externalities.

The purpose of the present analysis is to analyze whether and to what extent tourism activity (the tourism market) affects urban house prices in 103 Italian cities. It is used a System GMM approach for the time span of 1996–2007. After controlling for characteristics of the local housing markets, amenities, geographical variables and urban size, tests for the effect of tourism are performed by employing a composite index that captures the tourism specialization of each area under analysis.

Results are robust and confirm that overall and for the case of Italy, tourism has a positive and significant effect on house price levels. By comparing the city center, suburban and peripheral locations no great variations of these effects are found. The positive link between tourism and house prices in Italy needs to be interpreted cautiously because cities in Italy are very different. Further investigation on this direction has given several hints on the existence of potential different tourism-house price relationships for group/types of cities.

Present findings induce the possibility for further research on the form of these effects. A possible extension of the present work is to see whether and to what extent this relationship is positive, negative or even not significant for the cities under investigation. This specific analysis requires the use of other types of estimators such as, for instance, the mixture models that search for different regimes in the relationships under analysis. Further development of the present work is to investigate whether and to what extent this relationship holds also for other tourism countries.

In terms of the policy implications, on the one side, results confirm that on average tourism is important for local economic growth of Italian cities; however, on the other side, there is a delicate environmental and social equilibrium in tourist destinations, which can easily be upset. In other words, from a strict economic point of view, the higher value of housing in tourism destinations can be observed as a positive signal of tourism–related local growth and the presence of natural, cultural and man-made amenities. However, to correctly evaluate the net overall benefits of the resource allocation in the tourism sector, it is essential to determine *who benefits* and *who pays* (Pearce 1989) for local tourism development (Butler 1980). Problems may arise when the pressure on house prices is such that it creates serious social effects in terms of affordability, displacement, and gentrification.

APPENDIX

Tourist indexes

In the present analysis, the choice of the Van der Waerden ranking score (see subsection 4.4.2) is based on the previous works by Biagi *et al.* (2012) and Biagi and Faggian (2004). Others tourist indexes exist, which have been used in economic literature for descriptive purposes. In order to provide a detailed view of these indexes, it is produced a list with a brief description and the source of these tools available for tourism analysis.

- **Defert's Tf** (tourist function) by Defert (1967). It is a measure of the importance of tourism in a regional economy. The index is computed as a ratio between the number of tourist beds (N) and the resident population (P):

  $$Tf = {}^{100(N)}/_{P} \quad \text{(A.4.1)}$$

  According to Vaccaro (2007), the higher the index the higher the connection between resident population and tourists. High value of *Tf* implies the dependence of resident population by the tourism economy. For *Tf>100* tourists can be more than resident population in the area.
  But, as emphasized by Smith (1995), this index could be used with caution, because very large cities such as Paris or Mexico City will have a small *Tf* with respect to small resort towns. Nevertheless tourism sector in Paris is not unimportant.
  Source: P. Defert (1967), Le taux de fonction touristique: mise au point et critique. *Les cahiers du tourisme.* Centre des Hautes Etudes Touristiques, Aix-en-Provence, C-13.

- **Tourist function for hotels** by ISTAT. It is computed as the *Tf* (A.4.1), but only for beds in the hotels.
  Source: P. Innocenti (2007), *Geografia del turismo*, Carocci.

- **Tourist function for other accommodation** by ISTAT. It is computed as the *Tf* (A.4.1), but only for beds in other accommodation.
  Source: P. Innocenti (2007), *Geografia del turismo*, Carocci.

- **Attractiveness of tourist consumption** by ISTAT. It is computed as a ratio between tourist nights of stay (or overnights stay; O) in total tourist accommodation and resident population (P):

$$A = O/P \qquad \text{(A.4.2)}$$

This index could be also called tourist rate and represents the level of crowding in a tourist destination in the period under analysis.
Source: ISTAT.

- **Gross occupancy rate of bed-places** by ISTAT. It is obtained by dividing the total number of nights of stay (P) by the number of the bed places on offer and the number of days:

$$Ul = {}^{P}/_{LG} * 100 \qquad \text{(A.4.3)}$$

where:
P=nights of stay in tourist official accommodation
L=beds in tourist official accommodation
G=number of days in the period under analysis
Source: ISTAT.

- **Net occupancy rate of bed-places** by ISTAT. It is obtained by dividing the total number of nights of stay by the number of the bed places on offer and the number of days when the bed places are actually available for use (net of seasonal closures and other temporary closures for decoration, by police order, etc.).
Source: ISTAT.

- **Density of accommodation establishments** by Italian Ministry of Tourism. Along with the *Tf index,* this is considered an important indicator able to evaluate the impact of tourism in the destinations. In addition, it allows one to compare different tourist destinations, such as coastal and mountain locations. The computation is based on ISTAT data at municipality level and it is the ratio between tourist nights of stay (O) and municipality surface:

$$D = O/Km^2 \qquad \text{(A.4.4)}$$

Source: Osservatorio nazionale del turismo.

- **Composite rate of accommodation function** by Vaccaro (2007). It is called *Tr* and is computed as a ratio between the number of beds (L) in total accommodation establishments and the resident population (Pop) times the surface (Sur) in Km^2:

$$Tr = (L/Pop * Sur) * 100 * 100 \quad \text{(A.4.5)}$$

This index represents the density of the tourism sector supply in respect of the area and the population. The higher the *Tr*, the higher the exploitation of resources in the area. Values too high of *Tr* could indicate the saturation level of the area.
Source: Vaccaro G. (2007), *La statistica applicata al turismo*, Hoepli Editore, Milano.

- **Jan O. Lundgren rate** by Lundgren (1966). It indicates the tourist attitude of an area as a ratio between resident population and number of tourist accommodations. As a result the area will be more tourist when the index has the lower value.
  Source: Jan O. Lundgren (1966), Tourism en Quebec, in Rev. De Géogr. De Montreal, 20(2):59-73.

- **Residential tourist function rate** by Barbier (1965). It is the ratio between the number of residential houses and the total number of occupied house in an area.
  Source: B. Barbier (1965), Méthodes d'études des résidences secondaires. L'exemple des Basses-Alpes, in "Mèditerranée" 2: 89-115.

- **Second homes index** by C. Commerçon (1973). It is the ratio between the number of non-occupied houses and used as holidays homes and the total number of houses in an area.
  Source: C. Commerçon (1973), Le residances secondaires du Maconnais: essai d'etude quantitative, in "Revue de Geogr. E Lyon", XLIII, 4: 332.

- **Touristic affluence spatial index** by J. P. Lozato-Giotart (1985). It is the spatial index of tourist flows and it computed as a ratio between the number of tourist accommodation and the area surface in Km^2.
  Source: Jean-Pierre Lozato-Giotart (1985), Géographie du tourisme. De l'éspace régardé à l'éspace consommé, Collection Géogr., Masson, Paris.

The indexes described in this appendix are the most important tools used in descriptive tourism analysis, but they are not the unique. Among these do not cited in this work, there are the peaking index, the directional bias index and the tourism attractiveness index, developed specifically for tourism and recreation. While others, are more famous in social sciences and geography.[108]

[108] For further information on these tourist indexes, see Smith (1995), Chapter 9.

CHAPTER V

Tourism taxation in Sardinia: a Synthetic Control analysis

5.1 Introduction

Previous chapters have focused on two empirical analyses on the effects that tourism generates on tourist destinations, in particular on crime rate and house prices. In this chapter it is presented a policy evaluation analysis on a specific case study concerning the application of the tourism taxation as an instrument to deal with environmental externalities.

The Chapter is organized as follows. Section 5.2 shows the theoretical model for tourism externality on environment. Section 5.3 reviews the relevant literature on tourism taxation. In section 5.4 are presented some examples of tourism taxation in European countries, with a particular focus on Italy and Sardinia. Section 5.5 describes the methodology used in the present analysis (i.e. synthetic control method); follows section 5.6 that provides information about the case study of Villasimius, along whit the subsection 5.6.1, in which is computed the demand elasticity in order to better interpreter the effect of the taxation. Section 5.7 shows the data, section 5.8 presents the main results from the empirical analysis and the robustness check (Subsection 5.8.1). The final section (5.9) draws conclusions along with policy implications.

5.2 The externality of tourism on environment

According to the *Unfriendly Tourism Hypothesis* (Candela and Figini, 2012) cited in the Section 3.2 of the present work, tourists enter into conflict with residents in several ways. For example, they usually produce too much trash, cause traffic jams and use structures, infrastructures and services used at the same time by residents. As a consequence the utility of residents is affected by a negative social effect that can be expressed as a cost *C(N)*. Therefore the social welfare can be written as the (3.1):

$$W(N) = B(N) - C(N) \quad (5.1)$$

As described in the case of crime as tourism externality, also in this case the environment consumption is generated by the tourism and causes a market failure.

Does a solution exist? The instrument of intervention is the tax (Candela and Figini, 2012; p. 532). Indeed, if the policy maker charges a tax t per holiday day spent by tourist in the destination, the private benefit becomes:

$$B(N) - t(N) \tag{5.2}$$

When the tax t is properly charged, namely t is equal to the marginal social disutility, in that case the market failure is solved.

Policy makers and local administrations use several instruments of intervention. In this Chapter the focus will be on tourist taxation on nights of stay in tourist official accommodation, but it is worth to notice that it is not the only instrument. There are cities that charge taxes on tourists entering in the city center, such as London, or cities that make tourists pay a fee when they arrive by boat, such as Capri (Naples, Italy). Candela and Figini (2012) list three typologies of tourist taxes:

- Lump sum: a fixed tax paid by each tourist at the arrival in the destinations. It is often charged in airports or ports.
- Excise tax (or duty): a proportional tax based on the length of stay in a tourist destination. It is charged in hotels or other tourist accommodation.
- *Ad valorem* tax: a sum proportional to the price paid for the holiday such as for example the VAT paid on tourist services[109].

As mentioned before, the case under analysis focus on the second type of tax described above. Notwithstanding the Italian name of the tax is "*Imposta di soggiorno*", its characteristics are those of an excise levied on accommodation consumption.

5.3 Literature review

This section provides a literature review on the economic models and empirical applications on tourism taxation. According to Gooroochrn and Sinclair (2005), the topic of tourism taxation is rather complex and very few studies focus on the effects of such policies on the tourism activity.

[109] An *ad valorem* tax is a tax with the rate as a percentage of prices. The difference with the so-called *ad quantum* tax is that the second one represents an amount (unit tax) per night.

One of the first investigations by Mak and Nishimura (1979) analyzes the effect of a hypothetical tourist tax levied on hotels in Hawaii[110]. The authors find two main results. First, a special hotel room tax will have a negligible impact on visitor trip demand and on visitor lengths of stay. Second, a special hotel room tax can generate additional tax revenue to the state, but at the cost of reducing private sector income. Combs and Elledge (1979) examine taxation on tourists selecting hotels and motels in the United States and highlight that a small *ad valorem* tax has very little impact on the tourism sector although it generates substantial revenues for the local government. However, all the above-mentioned studies highlight that, given the composite nature of the tourism product, an increase in taxation on one component may reduce expenditure on the other components if substitute effects are present (see also Papatheodorou, 2001). Although two previous analyses are pioneering for this topic, they are not without drawbacks. Indeed, Mak and Nishimura (1979) employ a cross section survey in which the variable of price is not measured with precision; while Combs and Elledge (1979) impose the inelasticity of the demand but without empirical evidence.

Fujii *et al.* (1985) by using a system approach and time series data for the period 1961-1980 in Hawaii, study the exportability of the hotel room tax. The authors, correcting for the first order serial correlation, found that a hotel room tax is highly exportable, but with moderately large negative output effects on the lodging industry. A further empirical analysis on tourism tax in Hawaii by Bonham *et al.* (1992), via a time series analysis, estimates *ex post* the impact of taxation levied on the nights of stay in hotel accommodations in 1987, by analyzing real net hotel revenues of these two variables before and after the imposition of the tax (see also Bonham and Gangnes, 1996). The novelty of this paper, with respect to the previous, it the use of tax data rather than surveys data to measure hotel receipts. Empirical results show that the tax effect on real net revenues is not significant. Indeed, the demand for accommodation is close to be perfectly inelastic. Furthermore, analyzing the case of Mauritius via Computable General Equilibrium (CGE), Gooroochurn (2004) and Gooroochurn and Sinclair (2005) confirm that tourism taxation is more efficient than taxing other sectors in terms of domestic welfare.

Turning to the European case studies, some papers analyze its whit controversial results. On the one hand, Durbarry and Sinclair (2002) investigate

[110] In Hawaii a 5% hotel room tax called *"transient accommodations"*, but commonly known as hotel room tax, was imposed in January 1987, following the Act 340 passed in 1986. "Transient accommodation" includes accommodation usually occupied by tourists for less than 180 consecutive days. The tax was increased by one percentage point in July 1994 to finance a new Honolulu convention center (see Bonham *et al*., 1992; Bonham and Gangnes, 1996).

the effect of tourism taxation in the United Kingdom during the 1990's [111]. The authors find that tourism expenditure is sensitive to changes in prices with an elasticity value of unity: this implies that when prices increase of certain percentage tourism expenditures will decrease by the same percentage. Jensen and Wanhill (2002), examining the case of Denmark accommodation Value Added Tax (VAT henceforth) in 1996, argue that the tourism taxes growth in recent years is not welfare enhancing. In fact, governments often consider tourism taxes as "easy money" obtained from non-resident population.

On the other hand, Taylor *et al.* (2005) investigate the willingness-to-pay (WTP henceforth) for environmental quality in the Croatian island of Hvar. The authors examine the potential implications of using tourist eco-taxes, taking into account the quality of the environment, quality of life of residents and tourist welfare as key attributes of sustainable tourism. They find that the WTP for environmental protection is higher (0.65€ per day) than the proposed tax. On the same topic, Guzmán (2004) and Aguilò *et al.* (2005) analyze the impact of eco-taxes in the Balearic Islands, Spain, where the regional government abolished the tax in 2003 to avoid any possible loss of competition. However, according to Guzmán (2004), tourism taxation is an adequate solution to counteract negative impacts due to tourism. In this respect, the authors highlight that the Canary Islands and Andalucía need a shift towards tourism markets that are more sensitive to a sustainable development and the application of a tourist tax would allow for a move in this new direction. Specifically, the study of Aguilò *et al.* (2005) highlights that German, British and Dutch tourists are willing to travel long distances to visit warm destinations, therefore, their travel decisions may not be price sensitive. More recently, Gago *et al.* (2009) make a comparison between specific, for instance the hotel room tax, and general indirect taxation such as VAT, for the case of Spain. In conclusion of their analysis, they find that both direct and indirect taxation has not a statistically significant effect on the economy as well as on the tourism sector in general.

Since the tourism tax has been re-introduced only recently in Italy (2011), empirical research is, to date, rather limited. Perelli *et al.* (2011) analyzing the perceptions of tourists on the tourism tax in Villasimius by using an *ad hoc* questionnaire, find that tourism taxation does not significantly affect consumers' choice. From their analysis it emerges that the location is chosen for its high environmental quality. Besides, Biagi *et al.* (2013) performing a descriptive analysis of tourist flows before and after the application of the tax, for the case of

[111] There are two main types of tourism taxes in the UK: Value Added Tax (VAT) is generally applied and specifically for tourists, an Air Passenger Duty. Receipts from VAT (at 17.5%) are particularly important: in 1999 hotels and other accommodation provided around £1 billion. Pay As You Learn is also a major type of tourism taxation: the hotels and catering sector contributed around £1 billion in the same period. Direct charges are significant: Air Passenger Duty contributed over £824 million in 1998 (Durbarry and Sinclair, 2001, p.6).

Villasimius and Sorso (a municipality located in the North-West of Sardinia) find results in line with those of Perelli *et al.* (2011).

The literature review highlights that the most of the studies focus on the United States. The reason is the popularity of this tax, typically imposed on occupied hotel rooms. According to Bonham *et al.* (1992) in 1990 forty-seven out of fifty American states levied taxes on hotel room occupancy. On the contrary, in Europe, the interest on this topic is relatively recent. Although, to date, the tax is levied in the majority of countries (see Table 5.1), the real impact on tourist flows has not been extensively measured. The papers analyzed so far suggest the important role of tourism and the consequent potential benefits generated by tourism taxation. Yet, in order to implement adequate policies, an assessment on the distortions generated by a tourism tax is also needed. In this context, an *ex ante* and *ex post* analysis on the tourism tax recently issued in Italy may give a clearer picture to policy makers on its overall effects.

5.4 Tourism taxation in European countries

In Europe, there are several examples of countries, or regions, that have adopted tourism taxation. Table 5.1 provides an overview on the different tourism taxation issued in the European Union (EU) and in a few countries outside EU (i.e. Switzerland, Russia and Ukraine)[112]. As one can notice, tourism taxes have been issued at different times and with different schemes.

In Austria, for example, the tax is managed by the regional governments and its application depends upon the type of accommodation (hotel and campsites are included). Tourists pay the rate per night at the end of their stay. Some exceptions are represented by children under 15, hospital patients and those people who are visiting close relatives. Belgium is an interesting case, because in some cities the city tax is levied on consumers (Bruges and Ghent), while in some others on producers (Antwerp and Brussels). In the latter case, hotels pay an amount to the local authority on the basis of the number of rooms and its quality (number of stars). In France, the *Taxe de séjour* has been applied since 1910. It is a municipal tax and the revenues are used to develop and improve tourism infrastructure, increase accommodation supply and promote the environment. This tax varies on

[112] All information about tourism taxes in Europe are available on the European Tourism Association (ETOA) website (www.etoa.org). The association members are over seven hundred including global travel buyers, hotels, tourist boards, attractions and other European tourism suppliers.

location and type of accommodation. However, the rate is the highest in hotels *cinq étoiles*, whereas in the other hotels and holiday camps the amount is lower.

In Germany, this tax was initially applied only to thermal accommodation. At the moment, the so-called *Kurtaxe* can be adopted by the Länder that autonomously decide whether to issue it and its rate. Since 2010, there has been an exponential growth of tourism tax implementation, probably due to the need of regional governments to counteract the loss of revenues occurred after the decrease of the VAT. In most cities, the tax is a fixed amount (*ad quantum* tax) and only a few municipalities levy an *ad valorem* tax (i.e. a fixed share of the total expenses on accommodation)[113]. In 2013, Berlin and Hamburg have introduced tourism taxation. In the Netherlands, the so-called *Toeristenbelasting* is levied in the majority of municipalities. The type of taxation depends on the cities: in some cases it is *ad valorem*, while in others it is proportional to the quality of the accommodation.

In Switzerland, individual cantons choose the type of tourism taxation. Currently, all cantons, with the exception of Zurich, Basel-Landschaft and Thurgau, apply tourism taxation. In the canton of Aargau, the law permits the tax to be issued only in health centers. Either tourism authorities or the municipalities collect the tax. Recently, the majority of cantons are rethinking to increase their tax rates. Additionally, a further yearly tax exists, which is levied on second-home owners and is based upon the number of beds. The total revenue is entirely used to finance accommodation infrastructures, support for tourism, information and entertainment. In the Balearic Islands (Spain), a tourism tax was levied in 1999 as an environmental tax but was repealed in 2003[114]. In 2012, Catalonia employed a tourism tax that varies according to the quality of the accommodation. Besides, cruiser passengers pay 2.50 euros each time they arrive at a regional port. In 2011, the United Kingdom planned the introduction of the so-called *Bed Tax.* After criticisms from the tourism sector associations, the government ended the implementation.

In Italy, the tourism tax is called *Imposta di soggiorno* and was introduced for the first time in 1910 only on thermal resorts and seaside destinations[115]. In 1938, it was extended to other tourist destinations[116] and was abolished in 1989[117]. More than twenty years later, in 2011, the tax has been reintroduced at a municipality

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[113] See footnote 109 of this chapter for a definition of *ad valorem* and *ad quantum* taxes.

[114] The Balearic Islands are a tourist region. The tourism and services sector revenues represent 80% of the total regional GDP. Resident population pays public services offered to residents and tourists. For this reason, government decided to adopt the taxation. The idea was that the revenues would have increased regional budget of 10%, considering that tourists are not sensitive to price increase (Aguilò *et al*., 2005).

[115] Law n. 863/1910; in G.U. 20 December 1910, n. 294.

[116] R.D.L.1926/1938, modified in L. 739/1939; in G.U. 29th December 1938, 297.

[117] Art. 10, D.L. 66/1989, modified in L. 144/1989; in G.U. 26th April 1989, 96.

level[118]. According to the new law, in order to apply the tax the municipality must have certain characteristics, such as:

- Capital of the province;
- Part of a group of municipalities;
- Tourist municipality;
- City of art.

The tax is paid by overnight visitors, according to the definition, can be named as tourists in official registered accommodation such as hotels, campsites, B&B, hostels.

According to the *Observatory of Tourism Tax* of Italy, to date, the actual number of municipalities that have implemented the tax is 489 (Mercury, 2014) recording an increase of 47% from 2012. Federalberghi[119] reports that the regions of Piedmont and Tuscany have the highest number of municipalities (respectively, 98 and 94) that issued the tax, followed by Valle d'Aosta, Lombardy, Veneto and Campania (57, 54, 34 and 29, respectively). In Valle d'Aosta, the tax is adopted by 77% of municipalities, while in Tuscany the percentage is 36%. Notably, other northern regions of Italy, such as Friuli Venezia-Giulia, do not apply the tax and Trentino-Alto Adige levy the tax in three municipalities.

In 2011, the national government introduced another type of tourism tax that is issued on various types of boats. This tax is called *Imposta di sbarco* (D.Lgl. n. 23/2011) and can be levied by municipalities located on small islands. In 2014, twenty-one municipalities were reported to have adopted this tax (Mercury, 2014).

In the appendix is provided a complete list of Italian municipalities applying the taxes mentioned above (Table A.5.1).

[118] Legislative decree 23/2011.
[119] Federalberghi is a national organization that represents Italian hoteliers.

Table 5.1 Tourism taxation in Europe

	Typology of taxation	*Rate in €*	*Taxable*	*Collection*	*Main cities*
EU-15					
Austria	Proportional share to the accommodation quality	0.15-2.18 per person per night	Tourists	Accommodation	Vienna, Graz, Innsbruck
Belgium	Proportional to the hotel level	400-2,880€ per room per year	Accommodation	Local authority	Brussels
	Fixed tax	2.50 per person per night; 2.25 per person per night (0.50 in campsites)	Tourists	Accommodation	Ghent Antwerp
	Ad valorem	1.8% of total expenses			Bruges
France	Proportional share to the accommodation quality	0.20-1.50 per person per night	Tourists	Accommodation	Paris, Reims, Bordeaux, Lyon, Montpellier
Germany	Proportional share to the accommodation quality	1.00-3.00 per person per night	Tourists	-	Gottingen, Weimar
	Ad valorem	5% of total expenses			Aachen, Berlin, Cologne, Dortmund
Italy	Proportional share to the accommodation quality	0.50-5.00 per person per night	Tourists	Accommodation	Roma, Venice, Florence, Siena
Netherlands	Proportional share to the accommodation quality	0.55-4.76 per person per night	Tourists	-	Delft, Eindhoven, Leiden, Maastricht
	Ad valorem	4.5%-5% of total expenses			Amsterdam, Rotterdam, Utrecht
	Fixed tax	3.50 per person per night			Eindhoven
Portugal	Proportional share to the accommodation quality	1.00-1.90 per person per night	Tourists	Accommodation	Lisbon
Spain	Proportional share to the accommodation quality	0.75-2.50 per person per night	Tourists, cruisers	Accommodation	Barcelona

EU-28					
Bulgaria	Proportional share to the accommodation quality	maximum 1.53 per person per night	Tourists	Accommodation	Sofia and main coastal cities
Croatia	Proportional share to the accommodation quality	0.25-1.00 per person per night	Tourists, cruiser	Accommodation, ships, travel agency	Dubrovnik
		yearly proportional share to number of beds	Owner of holidays homes	Local authority	
Romania	Ad valorem	0.5%-5% of total expenses	Tourists	Accommodation	Bucharest
Slovakia	Proportional share to the accommodation quality	0.50-1.65 per person per night	Tourists	-	-
Slovenia	Proportional share to the accommodation quality	0.60-1.25 per person per night	Tourists	Accommodation	Ljubljana, Vaneča, Vino, Focovci
Countries not-UE					
Russia	-	1–3 per person per night	-	-	San Petersburg, Moscow
Switzerland	Proportional share to the accommodation quality	0.50-6.00 per person per night	Tourists	Tourist authority, Municipalities	All Cantons, except Zurich, Basel-Landschaft, Thurgau
		12.43-82.84 per number of beds	Owner of holidays homes		
Ukraine	Ad valorem	1% of total expenses (breakfast excluded)	Tourists	Accommodation	Kiev, Ivano-Frankivsk, Kamianets-Podilsky, Lviv, Lutsk, Odessa, Repubblica di Crimea

Note: Exceptions are provided for by low in the majority of the countries for children, handicapped, school or college groups, people visiting spouses or close relatives resident
Source: Author’s elaboration on ETOA information

5.5 The methodology: synthetic control

Normally, in policy evaluation analysis, the *"treated"* group under investigation is the group of individuals targeted by the policy. By using specific techniques the former group is compared to the *"non-treated"* group (or control group) before and after the *"treatment"*, i.e. the policy under analysis[120]. Specifically, the non-treated is a group of individuals having the same, or similar, characteristics of the treated one but not targeted by the policy under analysis. One of the most difficult tasks researchers generally face when using policy evaluation technique is the definition of the control group. Following Abadie and Gardeazabal[121] (2003), the novelty of the so-called *Synthetic Control Method* (SCM henceforth) is to use a *"composite"* control group[122]. The control group does not consist of specific individuals that already exist and chosen a priori by the researcher, but rather it is a group that is artificially created on the basis of already existing individuals. In other words, the control consists of a set of J (that can be individuals, municipalities, regions, countries, etc.), where each j is weighted by the $W = (w_1,..., w_j)$, which is a ($J X 1$) vector of nonnegative weights whose sum equal one. The scalar w_j $(j =1, ..., J)$ corresponds to the relative weight of each j under analysis in the synthetic control. Each different value for W generates differences in the synthetic control, so that the choice of a valid subset of control units is crucial to minimize the differences between the synthetic control and the case under study before the policy application.

The basic idea is that the future path of the synthetic control group mimics the path that would have been observed in the treated unit in the absence of the treatment. Precisely, the weights are chosen in order that the synthetic control *most closely resembles the actual one before* the treatment (Abadie and Gardeazabal, 2003; p. 117). The importance of this recent methodology is also demonstrated by Baltagi (2014), who for the first time includes this approach in his fifth edition of panel data econometric book. He highlights that "*the combination of units often provides a better comparison for the unit exposed to the intervention than any single unit alone"* (p. 19).

[120] The terms adopted in this type of studies are borrowed from the medical literature. To simplify the exposition, in this work are adopted the terms "unit", "treatment" and "output" which substitute respectively "municipality", "tourism taxation" and "tourist flows".
[121] Alberto Abadie is Professor of Public Policy at the John F. Kennedy School of Government, Harvard University, Cambridge; Javier Gardeazabal is Professor of Economics at the Universidad del Pais Vasco in Bilbao, Spain .
[122] This model can be computed in STATA using the command *synth* designed by J. Hainmueller, (MIT), A. Abadie (Harvard University) and A. Diamond (IFC). In *R* the software is available as the *Synth* package from the Comprehensive R Archive. MATLAB code is available on the authors website.

In detail, this methodology employs a sample of $J + 1$ units, where $j = 1$ is the case of interest and units $j = 2$ *to* $j = J + 1$ are the potential units of comparison. The sample is a balanced panel including units observed for the same time period $t = 1, \ldots, T$ [123]. Without loss of generality and for simplicity it is usually assumed that only one unit is exposed to the event or policy intervention. Abadie *et al.* (2014), in case of multiple units affected by the event of interest, suggest applying separately the methodology to each of the affected units or aggregating all the affected units. Two relevant features of the control group outcomes are:

1. they are thought to be driven by the same structural process as the treated unit;
2. they were not subject to structural shocks during the sample period of the study.

Let X_1 be a vector (k X 1) including the values of the pre-treatment characteristics of the treated unit and X_0 the matrix (k X J) containing the values of the same variables for the control group. The following vector (5.3) represents the differences between the pre-treatment characteristics of the treated unit and the control group, which is weighed by W:

$$X_1 - X_0 W \tag{5.3}$$

In order to better match two groups, it is necessary minimize the magnitude of this difference. Abadie *et al.* (2014) following the previous application by Abadie and Gardeazabal (2003) and Abadie *et al.* (2010) state that W^* have to be chosen so as to minimize (5.4):

$$\sum_{m=1}^{k} v_m \left(X_{1m} - X_{0m} W\right)^2 \tag{5.4}$$

where:

v_m is the weight that reproduces the relative importance assigned to the m-th variable after measuring the discrepancy between X_1 and X_0W;

X_{1m} is the value of the m-th variable for the treated unit;

X_{0m} is the vector (1 X J) including the values of the m-th variable for the control group.

In addition, let Y_{jt} be the outcome of j at time t it is possible to define Y_1 as a vector (T_1 X 1) including the post-treatment values of outcome for the treated unit and also Y_0 as a matrix (T_1 X J) containing the post-treatment values of the outcome for $j + 1$ units.

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[123] See Chapter 3 (footnote 34) for a definition of balanced and unbalanced panel.

At this point, the synthetic control estimator of the effect of the treatment corresponds to the comparison between the post-treatment outcomes of treated unit and the post-treatment outcome of the control group. It is clear that the comparison is performed between the unit *j=1*, which is exposed to the policy intervention and the group of control, namely the synthetic control, which is not exposed to the intervention (5.5):

$$Y_1 - Y_0 W^* \qquad (5.5)$$

Using predictors (X_1 *and* X_0) measured in the pre-treatment period, the weights are selected so that the resulting synthetic control can minimize the root mean square prediction error (RMSPE henceforth) in the pre-treatment period. Indeed, RMSPE measures the lack of fit between the path of the outcome variable for any particular unit and its synthetic counterpart. The aim of the analysis is to measure the effect of the treatment on some post-treatment outcome.

To sum up, this methodology consists of two main steps, the former consists in creating the synthetic control, while the latter in calculating the counterfactual outcome $Y_{jt}^1 = Y_{jt}^0$, where Y_{it}^0 is the outcome matrix for the control group. By comparing the counterfactual to the treated unit, outcome treatment effects can be eventually evaluated such that:

$$\alpha_{jt} = Y_{jt}^1 - Y_{jt}^0 \qquad (5.6)$$

Although Abadie *et al.* (2010) argued that the potential applicability of SCM to comparative case studies is very large, especially in situations where traditional regression methods are not appropriate; so far SCM has been rarely applied. The first time the SCM has been applied was in 2003, when Abadie and Gardeazabal investigated the economic impact of conflict, using the terrorist conflict in the Basque Country as a case study. Furthermore, SCM it is applied at a regional level to analyze anti-tobacco policies in California (Abadie *et al.*, 2010). This paper, which the most cited after the first one of 2003, investigates on the effect of California's Proposition 99, a policy intervention implemented in California in 1988 in order to control tobacco consumption. Authors demonstrate that in the treated unit the outcome under analysis, namely the tobacco consumption, was lower than in the synthetic control units. In a recent analysis undertaken by the Bank of Italy, Pinotti (2012) used SCM to estimate the economic performance in two Italian regions exposed to mafia activity. In the same year, Coffman and Noy (2012) apply the methodology to evaluate the long-term impact of a 1992 hurricane on the Hawaii Island of Kauai, using as synthetic control the unaffected Hawaii Islands.

At a country level five works exist. Lee (2011) studies the effects of inflation targeting policy (IT) in emerging economies using data on GDP growth rate in thirteen IT countries in the treatment group and forty-seven countries in the non-treated one[124]. Hinrichs (2012) employs USA data surveys[125] on school enrolment in order to estimate the effect of affirmative action bans on education and demographic composition of universities. More recently, Billmeier and Nannicini, (2013) evaluate the impact of economic liberalization on real GDP per capita within a sample of 180 countries worldwide. Cavallo *et al.* (2013) examine the impact of catastrophic natural disasters in economic growth using a dataset of 196 countries over the period 1970-2008. More recently, Abadie *et al.* (2014) estimate the economic impact of the 1990 German reunification on West Germany. They use data on GDP over the time spam 1960-2003 for sixteen OECD countries as synthetic control for the West Germany[126].

Common features of these works include the territorial application, although still propose empirical analyses at the regional level. Whitin this thread of literature, the present study goes a step further by employing SCM at a municipality level, hence providing a more microeconomic framework.

5.6 The case study: Villasimius (Sardinia)

Since 2007, Sardinia has been the first Italian region that has allowed town councils to levy tourism taxes as a means to internalize negative externalities. A regional law issued the tourism tax in May 2007 (law number 2, 29th of May 2007, art. 5) by introducing the possibility for local councils to apply a tourism tax during the peak season. In 2008, Villasimius located in southern part (Cagliari Province, see Figure 5.1) levied the tax[127]. However, it lasted a very short period of time as in 2009 (after the fall of regional government) this excise was repealed.

[124] Treated units are: Brazil, Chile, Colombia, Czech Republic, Hungary, Israel, Korea, Mexico, Peru, Philippines, Poland, South Africa and Thailand. Non-treated group includes: Algeria, Argentina, Belarus, Bulgaria, Cape Verde, China, Costa Rica, Côte d'Ivoire, Croatia, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Georgia, Guatemala, Hong Kong, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Latvia, Lebanon, Lithuania, Macedonia, Malaysia, Mauritius, Morocco, Nigeria, Pakistan, Panama, Paraguay, Romania, Russia, Singapore, Slovak Republic, Slovenia, Syria, Taiwan, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, and Venezuela.

[125] Current Population Survey (CPS) and American Community Survey (ACS).

[126] Australia, Austria, Belgium, Denmark, France, Greece, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, the United Kingdom and the United States.

[127] In the same year, also Sorso located in the northern part of the island (Sassari Province) applied the tourism tax.

Two years later, in 2011, the national government introduced a national tourism taxation law[128] and the municipality of Villasimius reintroduced it[129].

Villasimius ranks first in the province for number of tourists with a quota of 22% of the province's number of nights of stay. In the town, the supply of tourist accommodation has constantly increased; however, contrarily to the rest of Sardinia, Villasimius has not experienced a sharp increase in the number of B&B (in 2012 the official statistics recorded only three units over around 40 hotels[130]). As a result, its tourist supply is characterized by high quality of tourist services and it is considered as one of the most famous in the Mediterranean Sea.

Figure 5.1 Map of Italy (A=Villasimius)

Source: elaboration on Google maps, November 2014

The town council of Villasimius includes the marine protected area of Capo Carbonara that extends over an area of approximately 8.6 km^2, that include sandy beaches and the Notteri pond characterized by a rather fragile environmental setting. Since the second half of the 1990s, Villasimius has pursued a process of

[128] Legislative decree n.23 (art. 4) "Disposizioni in materia di federalismo fiscale".
[129] Sardinian municipalities that apply the tax are, to date, ten: Budoni, Carloforte, Castiadas, Domus de Maria, Fordongianus, Maracalagonis, Muravera, Pula, Teulada, Villasimius. Alghero will start in 2015.
[130] ISTAT "Capacità degli esercizi ricettivi".

environmental improvement trading off preservation and exploitation of resources in an attempt to get the most benefit and to ensure at the same time the sustainability of the tourism development. For these reasons, Villasimius is configured as an interesting case study whose results in the management policy represent a useful reference for other tourism destinations.

The tax applies to those tourists that choose official accommodations over the summer period (from 15th of June to 15th of September). Owners or managers of accommodations collect the tax, and the public revenues are allocated to improve tourist services and the environment.

As far as revenues are concerned, Villasimius from June to September 2008 collected approximately 503,430 euros. In the other three years of application revenues have been: 392,104 euros from July to August 2011; 631,000 euros from June to September 2012 and 637,640 in the same period of 2013.

The revenues obtained in 2011 and 2012 were allocated to improve tourist services and to finance local environmental policies[131].

Therefore, as mentioned in the introduction, the aim of this analysis is to assess the impact that tourism taxation has on tourist flows in Villasimius. To this purpose, tourist flows in Villasimius during the tax application are compared to a weighted combination of other Sardinian municipalities chosen as a control group before the tax imposition. The weighted average of other Sardinian municipalities represents a "synthetic" control without tourism taxation. The control consists of forty-one municipalities that have been chosen in order to minimize the differences between the synthetic control and Villasimius before the tax implementation.

Table 5.2 Main characteristics of tourism tax in Villasimius (L.R. n.2/2007)

Taxable people	Non-resident population in Sardinian municipalities
Application time	From 15th June to 15th September
Withholding agent	Accommodation managers
Rate in €	€ 2 per night in 4 and 5 stars hotels € 1 per night in other accommodation
Tax revenues allocation	Interventions in the field of sustainable tourism with particular regard to the improvement of services provided to tourists and to the use of the environmental resource
Tax distribution	50% to the municipality and 50% to the regional government (special fund on tourist investments in internal areas)

Source: Author's elaboration

[131] Data on revenues and expenses are provided by municipality administration of Villasimius.

5.6.1 Tourist demand elasticity

From an economic perspective, a tax is generally associated with a deadweight loss that diminishes the overall welfare of the society in terms of less income, employment, fiscal revenue and foreign currency. Yet, the amount of the deadweight is related to the demand and supply price elasticity: the higher the elasticity of these functions the higher the deadweight loss and vice versa. However, as far as tourism is concerned, the overall effect is not so straightforward. Tourists, differently from many other "traditional consumers", move away from their usual place of residence to consume the commodity. Indeed, it is important to notice that tourism is a non-traded good in the sense that international trade is not possible since tourism is a non-exportable and non-importable good. Hence, tourism taxes may impact national and international tourists flows to different degrees according to the typology of the tax issued, place of consumption and ultimately consumers' tastes and preferences that influence demand elasticity and the final equilibrium after a new tax is levied. Consequently, the final economic impact depends on the relative price elasticity of foreign and domestic demand functions in a given destination. According to Bonham *et al.* (1992): "*If the incidence of the room tax falls partly on consumers, higher after-tax prices are likely to decrease the quantity demanded for lodging and the net revenues of hotel operators*" (p. 434).

Gooroochurn and Sinclair (2003), for example, present a partial equilibrium framework characterized by a perfectly elastic supply function, where prices are supposed sticky over the short run, and the national demand curve is relatively more elastic than the international demand curve. The latter hypothesis is realistic as the locals may have the better information on the tax scheme than international tourists and search for substitutes. The authors conclude that policy makers should be aware of the price elasticity of the two components of demand before raising a tourism tax. In contrast, increases in taxes can cause adverse effects on hosting community welfare if tourism demand by non-residents is more price elastic than domestic demand and / or supply curve is elastic. Nevertheless, policymakers may be also able to modify the elasticity of international demand, making it relatively less elastic, thanks to policies aimed at increasing the quality and differentiation of products and services offered[132].

In this context, to better understand the effects of taxation on tourist flows, it is necessary to know the price elasticity of tourism demand (β_2) in Villasimius. Due to the availability of data and the purpose of the present work, ε_p is measured, as a

[132] "If policy makers wish to increase tourism taxes, they can also consider the longer term strategy of attempting to make tourism demand by non-residents more price inelastic, for example, by increasing the quality of the tourism product and/or differentiating the product such that it gains some type of monopolistic advantage" (Gooroochurn and Sinclair, 2003; p.30).

standard cross section analysis (OLS), for 2011 regressing the following models (5.7) and (5.8):

$$Length\_stay_i = \beta_0 + \beta_1 \, Length\_stay_{i,t-1} + \beta_2 accom\_exp_i + \varepsilon_i \quad (5.7)$$
$$Length\_stay_i = \beta_0 + \beta_1 \, Length\_stay_{i,t-1} + \beta_2 total\_exp_i + \varepsilon_i \quad (5.8)$$

The estimations are performed by using variables in logs in order to interpret results as elasticities. The variable of interest is the expenses on accommodation and total expenses (pro capita and per die) and comes from a recent survey conducted by Centre for North South Economic Research (CRENoS) in 2012. This survey asked about tourists amount of holiday expenditure in the visited destination in Sardinia, travel costs are not considered. Data can be divided into by segment of demand, and by municipality. Results, divided into international (models 1 and 2) and domestic demand (models 3 and 4), show that:

1) international tourists have inelastic demand related to the accommodation price and the total expenses of the holiday;
2) domestic tourists have elastic demand related to the accommodation price and inelastic demand related to total expenses in the destination.

In general, results suggest first hints in order to the sensitivity of the two components, but at the same time, they have to be interpreted cautiously because of the simplicity of the model and the size of the sample.

Table 5.3 Price elasticity of tourist demand in Villasimius. Year 2011

Variables	**(1) International Length_stay**	**(2) International Length_stay**	**(3) Domestic Length_stay**	**(4) Domestic Length_stay**
Length_stay_Int$_{t-1}$	0.80***	0.68***		
	(0.096)	(0.090)		
Accom_exp_Int	-0.012			
	(0.067)			
Total_exp_Int		-0.12		
		(0.11)		
Length_stay_Dom$_{t-1}$			0.95***	1.01***
			(0.095)	(0.091)
Accom_exp_Dom			0.017	
			(0.051)	
Total_exp_Dom				-0.041
				(0.062)
Constant	0.53*	1.29**	-0.019	0.14
	(0.29)	(0.58)	(0.20)	(0.29)
Observations	18	20	18	19
R-squared	0.822	0.811	0.888	0.887

Notes: Robust standard errors are in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. All variables are in log.

5.7 Data

In Italy, ISTAT provides annual data on the tourism sector. Whereas demand side data are available at a provincial, regional and national level, supply side data are provided at the municipality level. The statistical information on tourism supply and demand of the officially registered accommodation (hotels, campsites, B&B) is collected on a monthly frequency by the relevant local office, which transmit the data to the Regional office (the so called, *Ufficio della Statistica Regionale*), and the latter to ISTAT. After appropriate adjustments, ISTAT publishes the official and definitive data. Unfortunately, this process is time consuming and ISTAT data are normally published after two years (for example in January 2014 ISTAT published data relates to the year 2012). Furthermore, ISTAT data for the demand side of the market (i.e. tourist arrivals and nights of stay) are not provided at a monthly frequency nor at the municipality level, therefore, in the present analysis, data are supplied by the local, provincial level statistic offices.

Specifically, monthly data at municipality level on tourist arrivals and nights of stay in the official accommodation over the period 2006-2011 are used for six final outcome variables:

1) domestic tourist arrivals,
2) international tourist arrivals,
3) domestic nights of stay,
4) international nights of stay,
5) length of stay of domestic tourists
6) length of stay of international tourists.

Given the availability of homogeneous data for the control group, the sample period begins in 2006, two years before the treatment as this is the first year for which data are available for the control group and it ends in 2011, as this is the year for which data are available. Therefore, the dataset is a strongly balanced panel including 252 observations. A complete list of variables and the relative sources are illustrated in the appendix (Table A5.2).

The synthetic control is constructed following two criteria: the location of the municipalities and the data availability. Firstly, the data have been collected on the municipalities in the Cagliari Province, which includes Villasimius; secondly, the sample has been extended to municipalities located in the two neighboring provinces, which are Carbonia-Iglesias and Ogliastra. To minimize the differences between the output of the treated unit and that of the control group, data on Alghero (located in the north of Sardinia - Sassari province) have also been included due to the fact that this municipality has a similar number of tourists as Villasimius[133].

5.8 Results

This section discusses the results obtained from the application of SCM to the case study[134]. Comparing Villasimius to the control group (Figure 5.2, 5.3 and 5.4), graphs show the trend of each of the tourism variables under analysis.

It is worth highlighting that the synthetic control algorithm attributes the weights by using all forty-one municipalities of the control group in each case with the only exception for domestic tourist arrivals and domestic nights of stay (Graphs 1 and 3). In such cases, the control number collapses to two and one municipalities, respectively (see the row "Control Number" below the graphs). The weights given to particular municipalities in forming the synthetic control are shown in Table A5.3 in the appendix. Furthermore, the root mean square prediction error statistic (RMSPE), which is minimized for the pre-treatment period, results higher than in the other cases (see Graphs 1 and 3 with respect to the other graphs). Overall, these results indicate that, on average, the pre-treatment features of the domestic demand are not close to those of the treated unit. For this reason, one can argue that the interpretation for the variables presented in Graphs 2, 4, 5 and 6 is more reliable. Hence, one carries on considering only the most statistically robust results.

Notably, Graphs 2 and 4 on international demand show an increase of international tourists in contrast with the control unit that experiences stabilization. Overall, after the treatment, the number of international arrivals in the control unit shows a higher volatility than the treated unit but the latter remains at a significantly higher level. The number of international nights of stay shows an increase after the treatment in Villasimius, especially in 2011, while a pronounced decrease is detected in the control unit, with a slight recover in 2011.

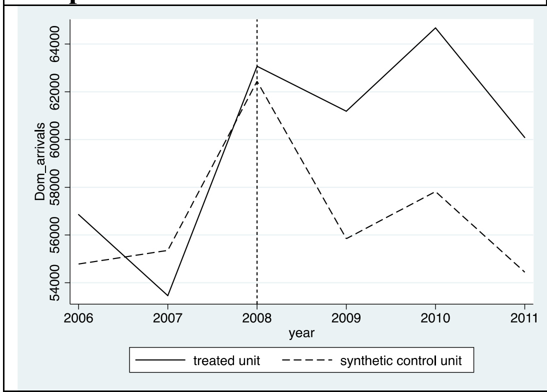
Regarding the length of stay, the situation for Villasimius in 2011 is significantly worse than the control unit (Graph 5), it seems that the domestic demand of Villasimius and the control group reduces the days of vacation since

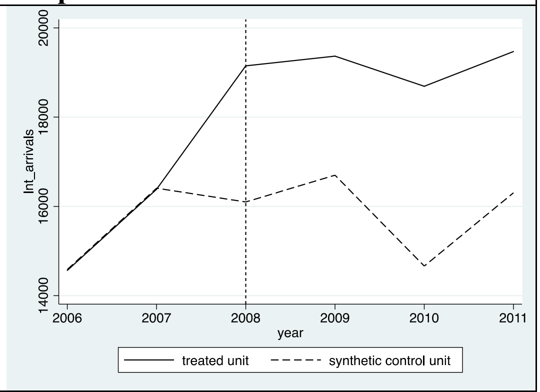
[133] Municipalities in Cagliari Province: Assemini, Burcei, Cagliari, Capoterra, Castiadas, Dolianova, Domus de Maria, Mandas, Maracalgonis, Monastir, Muravera, Nuraminis, Ortacesus, Pula, Quartu S.Elena, Quartucciu, S.Sperate, S.Vito, Sarroch, Selargius, Senorbì, Sinnai, Teulada, Uta, Vallermosa, Villa S.Pietro, Villaputzu, Villasor. Municipalities in Carbonia-Iglesias Province: Calasetta, Carbonia, Carloforte, Iglesias, Portoscuso, S.Antioco, S.Anna Arresi. Municipalities in Ogliastra Province: Bari Sardo, Cardedu, Gairo, Tortolì, Lotzorai. Municipalities in Sassari Province: Alghero.

[134] It is used the command *synth* available in STATA 12.

2007, this may indicate that the tourism taxation has had not much influence for such flows. Finally, the length of stay of international tourism (Graph 6) decreases for Villasimius in 2008 and then recovers over the following years, whereas the control unit experiences a sharp decline in both 2008 and 2009.

Figure 5.2 Trends in tourist arrivals: Villasimius vs. Synthetic control

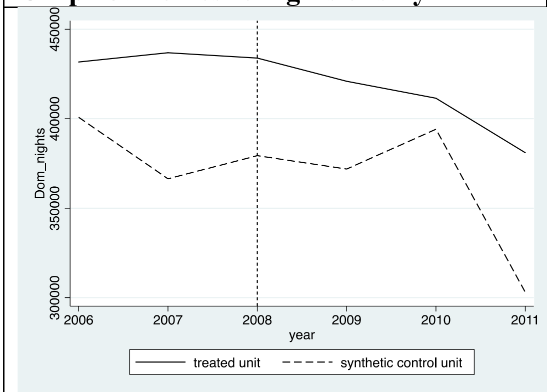


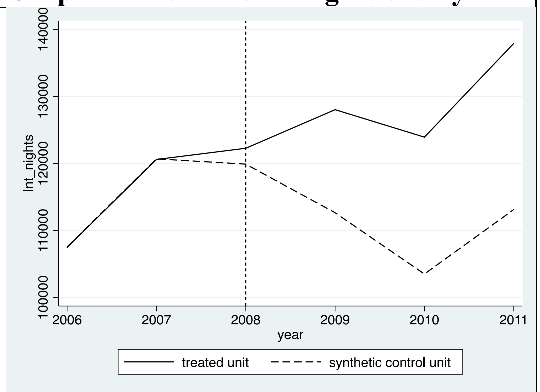


Graph 1. Domestic tourist arrivals	**Graph 2.** International tourist arrivals
RMSPE=1,985.44	RMSPE=0.000
Control Number: 2	Control Number: 41
W max = Alghero 0.96	W max = Pula 0.27

Source: Author's elaboration

Figure 5.3 Trends in nights of stay: Villasimius vs. Synthetic control



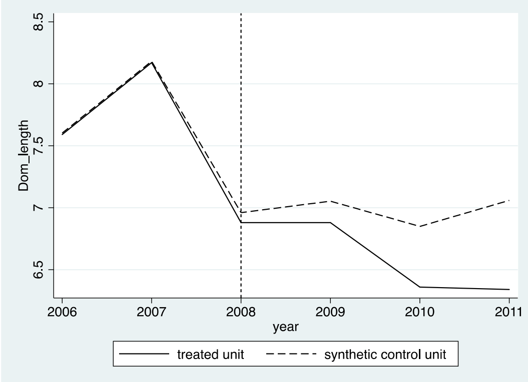


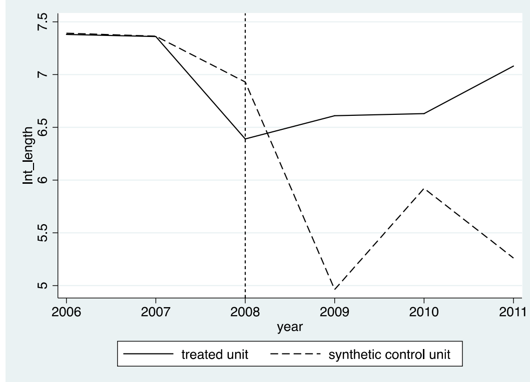
Graph 3. Domestic nights of stay	**Graph 4. International nights of stay**
RMSPE= 54,387.09	RMSPE=0.004
Control Number: 1	Control Number: 41
W max = Muravera 1.00	W max = Pula 0.35

Source: Author's elaboration

Figure 5.4 Trends in length of stay: Villasimius vs. Synthetic control

Graph 5. Domestic length of stay	**Graph 6. International length of stay**





RMSPE= 0.000	RMSPE= 0.000
Control Number: 41	Control Number: 41
W max = Sinnai 0.40	W max = Villasor 0.12

Source: Author's elaboration

These results seem to indicate that, in Villasimius, the tourism taxation have no effect on international tourist flows. Otherwise, after the treatment the trend in Graphs 2, 4 and 6 would show a net decrease in Villasimius. As far as domestic demand is concerned, the results of the SCM are not reliable, due to the fact that this component of the tourist demand has specific characteristics that are not directly comparable with other tourist destinations included in the synthetic control. The so-called predictor balance confirms this. Indeed, as indicated in Tables 5.4, 5.5 and 5.6 in the pre-treatment period the variables used as predictors present some difference in the weighted means.

Table 5.4 Tourist arrivals predictor means before the tax

	Domestic tourist arrivals		International tourist arrivals	
	Treated	Synthetic	Treated	Synthetic
Tot_accom	38.50	167.95	38.50	36.80
Density	51.79	176.31	51.79	166.96
Dist_port_euro(2006)	6.87	6.55	6.87	7.52
Dist_airport_euro(2006)	8.24	2.45	8.24	6.94
Dcoast	1.00	1.00	1.00	0.71
Dtour	1.00	1.00	1.00	0.80
Dom_arrivals(2006)	56,856.00	54,785.62	-	-
Dom_arrivals(2007)	53,459.00	55,355.70	-	-
Int_arrivals(2006)	-	-	14,567.00	14,587.06
Int_arrivals(2007)	-	-	16,384.00	16,407.92

Source: Author's elaboration

Table 5.5 Tourist nights of stay predictor means before the tax

	Domestic nights of stay		International nights of stay	
	Treated	Synthetic	Treated	Synthetic
Tot_accom	38.50	38.00	38.50	43.33
Density	51.79	50.91	51.79	143.78
Dist_port_euro(2006)	6.87	9.50	6.87	7.27
Dist_airport_euro(2006)	8.24	9.68	8.24	6.64
Dcoast	1.00	1.00	1.00	0.77
Dtour	1.00	1.00	1.00	0.84
Dom_nights(2006)	431,701.00	400,794.00	-	-
Dom_nights(2007)	436,858.00	366,426.00	-	-
Int_ nights(2006)	-	-	107,483.00	107,552.30
Int_ nights(2007)	-	-	120,603.00	120,692.20

Source: Author's elaboration

Table 5.6 Tourist length of stay predictor means before the tax

	Domestic length of stay		International length of stay	
	Treated	Synthetic	Treated	Synthetic
tot_accom	38.50	16.85	38.50	16.05
density	51.79	106.78	51.79	153.12
dist_port_euro(2006)	6.87	6.87	6.87	8.04
dist_airport_euro(2006)	8.24	6.41	8.24	7.48
dcoast	1.00	0.85	1.00	0.53
dtour	1.00	0.89	1.00	0.62
Dom_length(2006)	7.59	7.60	-	-
Dom_length(2007)	8.17	8.18	-	-
Int_length(2006)	-	-	7.38	7.39
Int_length(2007)	-	-	7.36	7.36

Source: Author's elaboration

5.8.1 Robustness check

In this section, a test of robustness is implemented to check for the sensitivity of the obtained results.

To better understand whether tourism taxation in Villasimius had a positive or negative impact on the resident population and the municipality overall, a *cost-benefit analysis* (CBA) is run. The CBA is a tool that allows comparing total benefits and total costs - in a specific place and in a specific time - in order to evaluate if the policy under analysis would generate a net benefit. If the aggregate of benefits exceeds the losses, it indicates a net benefit: $\sum V_i > 0$ where V_1, V_2,…, V_n are the benefits of each *n* tourist. In this analysis the total benefit is the total tourism taxation revenues in Villasimius in 2008, which is the first time the tax was issued. The cost is considered as an opportunity cost. In fact, by using the individual average expenditure per day of tourists in Villasimius, and multiplying this figure by the variation of nights of stay in 2008 compared with 2007, it is possible to have a satisfactory proxy for the total costs. The average expenditure per day is the result of a survey conducted by CRENoS in 2012.

After the tourism taxation implementation, Villasimius collected approximately 250,000 euros - of which 50% returned to the regional government. To this amount, the total amount of expenditure that tourists would have paid if they had been the same number as in the previous year it is deducted. Results show that Villasimius had a net benefit equal to approximately 115,000 euros, which increases to 367,000 euros in the case the total benefit is considered (Table 5.7).

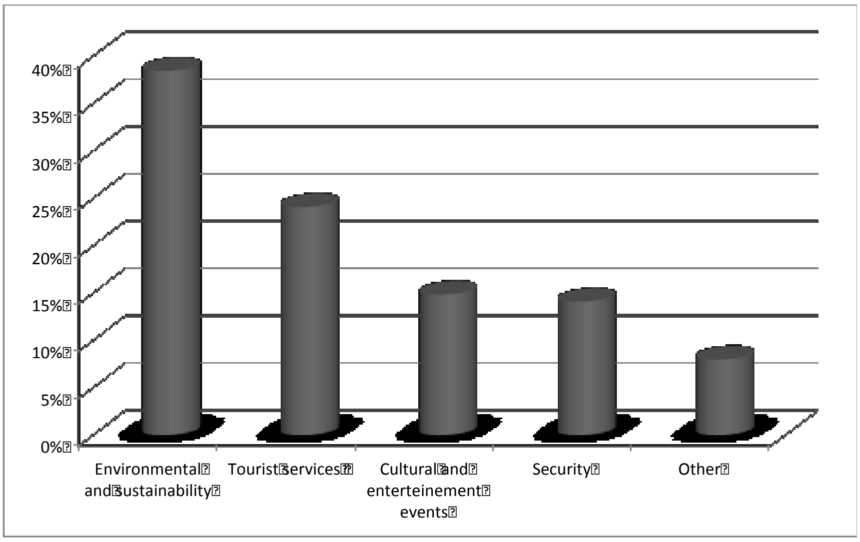
As already stated, it is worth noticing that by law the final allocation of the tax revenues is the tourism sector, with particular regard to the environmental sustainability and tourist services improvement. In this respect, this fiscal contribution can be defined as an earmarked tax since its main purpose is to protect the environment and to provide tourism services. Specifically, the highest quota (18%) was allocated to "Environmental and sustainability" that includes promotion, development and protection of the marine protected area and the sandy shore.

Table 5.7 Cost-Benefit Analysis (year 2008)

	Domestic tourist	International tourists
(A) Overnight stays (Variation 2008/07)	-2,973.00	+1,675.00
(B) Average expenditure per day in Villasimius (in €)	96.58	90.00
*A*B*	-287,132.34	150,750.00
Cost-benefit Analysis		
Total costs	-136,382.34	
Total benefits (tourism tax revenues)	503,430.00	
Total Benefits-Total costs (Sardinia from Villasimius)	367,047.66	
Net benefits	251,715.00	
Net benefits-Total costs (Villasimius)	115,332.66	

Source: Author's elaboration

Figure 5.5 Tourism tax revenues allocation (year 2011)



Source: Author's elaboration

5.9 Concluding remarks and limitations

The purpose of a tourism tax is to both generate local public revenues and to correct market failures. As discussed in the introduction, the latter can be seen as a sufficient but not necessary condition to levy a tourism tax.

The present analysis has adopted a SCM to investigate the impact of the tourism tax applied on the tourism demand in the municipality of Villasimius in Sardinia (Italy). This tourism destination has its own interest, as its tourism development is characterized by the high value of its environmental resources and coastal areas. The intensive development of tourism together with a strong environmental pressure requires the maintenance of specific balance in the management policy. In fact, an excessive exploitation of coastal resources would lead to a reduction of their intrinsic value, and consequently to an erosion of attractiveness which is a key factor competitiveness of the destination.

In this respect, the present study can be considered as a first attempt to evaluate the strengths and weakness of this policy aimed at protecting the environment. On the one hand, with the implementation of an ecotax, Villasimius obtains further local public revenues that are allocated to protect the environment, promote the municipality as a tourist destination, and improve the quality of services supplied during the tourism season. On the other hand, the municipality may suffer some costs due to the price competition of other tourism destinations.

The empirical evidence has suggested that the effect of the policy can be differentiated by separately investigating domestic and international demand, since these two segments of demand are characterised by distinctive features

(Pulina, 2011). On balance, for the international demand the effect of the tourism tax is positive for arrivals and nights of stay. However, for the domestic demand some statistical problems have arisen for arrivals and nights of stay; yet, robust results have been obtained for the domestic length of stay. The higher decline for Villasimius with respect to the control unit may also depend on other factors, since in 2009-2010 the tourism tax was not levied. This outcome needs to be further investigated by employing causal econometrics modelling, such as panel data, where it is more likely to capture the role played by other determinants. As a matter of fact, as reported in CRENoS (2013, 2012), domestic demand in Sardinia has experienced a decrease in the last decade, whereas international demand, although rather volatile, has experienced an overall increase.

Further research is currently planned to further extend the analysis with data on 2012 and 2013 when made available.

Acknowledgements

The author is grateful to the administration staff of the Province of Cagliari, Carbonia-Iglesias, Ogliastra and Villasimius municipality for their collaboration during the data collection phase.

APPENDIX

Table A5.1 List of Italian municipalities applying tourist taxes in 2014

	Imposta di soggiorno		*Imposta di sbarco*	
Region	**Municipality**	**Prov.**	**Municipality**	**Prov.**
Abruzzo	Caramanico Terme	PE		
	Pescasseroli	AQ		
	Roccaraso			
Basilicata	Bernalda e Metaponto	MT		
	Matera			
	Nova Siri			
	Maratea	PZ		
Calabria	Acquappesa	CS		
	Belvedere Marittimo			
	Cassano allo Ionio			
	Diamante			
	Praia a Mare			
	Mandatoriccio			
	Rende			
	Rossano			
	Scalea			
	Staletti			
	Borgia	CZ		
	Guardavalle			
	Soverato			
	Squillace			
	Villapiana			
	Briattico	VV		
	Pizzo			
	Tropea			
	Cirò Marina	KR		
	Cutro			
	Isola di Capo Rizzuto			
	Rocella Jonica	RC		
Campania	Agerola	NA	Anacapri	NA
	Barano d'Ischia		Capri	
	Casamicciola Terme		Procida	
	Forio			
	Ischia			
	Massa Lubrense			
	Meta			
	Napoli			
	Piano di Sorrento			
	Ravello			
	Serrara Fontana			
	Sorrento			
	Vico Equense			
	Camerota	SA		
	Cava de'Tirreni			
	Centola			
	Cetara			
	Conca dei Marini			
	Furore			
	Maiori			
	Pisciotta			
	Praiano			
	Salerno			
	San Giovanni a Piro			
	Sant'Agnello			
	Sapri			
	Vibonati			

	Sant'Agata de'Goti	BN		
	Sessa Aurunca	CE		
Emilia Romagna	Bologna	BO		
	Porretta Terme			
	Cattolica	RN		
	Riccione			
	Rimini			
	Cesena	FC		
	Gatteo			
	San Mauro Pascoli			
	Savignano sul Rubicone			
	Ferrara	FE		
	Fontanellato	PR		
	Parma			
	Maranello	MO		
	Modena			
	Ravenna	RA		
Lazio	Ardea	RM		
	Fiano Romano			
	Fiumicino			
	Monterotondo			
	Pomezia			
	Roma			
	Tivoli			
	Fiuggi	FR		
	Fondi	LT	Ponza	LT
	Gaeta		Ventotene	
	Sabaudia			
	Sperlonga			
	Terracina			
Liguria	Framura	SP		
	La Spezia			
	Sarzana			
	Genova	GE		
Lombardy	Bellagio	CO		
	Blevio			
	Cernobbio			
	Colonno			
	Como			
	Faggeto Lario			
	Griante			
	Lenno			
	Menaggio			
	Mezzegra			
	Nesso			
	Ossuccio			
	Pianello del Lario			
	Pognana Lario			
	Porlezza			
	Torno			
	Tremezzo			
	Valsolda			
	Veleso			
	Zelbio			
	Bergamo	BG		
	Costa Volpino			
	Lovere			
	Orio al Serio			
	Sarnico			
	Bormio	SO		
	Darfo Boario Terme			
	Sondrio			
	Valdidentro			

	Valdisotto			
	Valfurfa			
	Desenzano del Garda	BS		
	Gardone Riviera			
	Gargano			
	Iseo			
	Limone sul Garda			
	Manerba del Garda			
	Moniga del Garda			
	Padenghe sul Garda			
	Pisogne			
	Polpenazze del Garda			
	Salò			
	San Felice del Benaco			
	Siano del Lago			
	Tignale			
	Toscolano-Maderno			
	Tremosine			
	Ferno	VA		
	Ispra			
	Lodi	LO		
	Milano	MI		
	Morimondo			
	Monza	MB		
	Varenna	LC		
Marche	Ancona	AN		
	Senigallia			
	Fano	PU		
	Pesaro			
	Grottammare	AP		
	San Benedetto del Tronto			
	Macerata	MC		
	Recanati			
Molise	Agnone	IS		
	Termoli	CB		
Piedmont	Acqui Terme	AL		
	Alba	CN		
	Albaretto della Torre			
	Arguello			
	Barbaresco			
	Barolo			
	Benevello			
	Bergolo			
	Borgomale			
	Bossolasco			
	Bra			
	Canale			
	Castagnito			
	Castelletto Uzzone			
	Catelletto Uzzone			
	Castellinaldo			
	Castiglione Falletto			
	Castiglione Tinella			
	Castino			
	Ceresole d'Alba			
	Cerretto Langhe			
	Cherasco			
	Corneliano d'Alba			
	Cortemilia			
	Cossano Belbo			
	Diano d'Alba			
	Dogliani			
	Grinzane Cavour			

	La Morra Lequio Berria Magliano Alfieri Mombarcaro Monchiero Monforte d'Alba Montelupa Albanese Narzole Neive Neviglie Novello Perletto Piobesi d'Alba Priocca Prunetto Roddi Roddino Rodello Saluzzo San Bendetto Belbo Sanfré Santa Vittoria d'Alba Santo Stefano di Roero Serralunga d'Alba Serravalle Langhe Sinio Sommariva Perno Treiso Vezza d'Alba			
	Arina Casalino Castelletto Sopra Ticino Dormelletto Granozzo con Monticello Lesa Meina Novara Oleggio Castello Orta San Giulio Pettenasco	NO		
	Bardonecchia Borgaro Torinese Caselle Torinese Cesana Torinese Claviere Oulx Pianezza Plagelato San Benigno Canavese San Mauro Torinese Sauze d'Oulx Sestriere Settimo Torinese Torino Volpiano	TO		
	Baveno Bée Belgirate Cannero Riviera Cannobio Ghiffa Macugnana Mergonno	VB		

	Oggebbio Premeno Stresa Verbania Vogogna Biella Viverone	 BI 		
Puglia	Alberobello Fasano Ostuni Gallipoli Giurdignano Lecce Melendugno Nardò Otranto Salve Ugento Ginosa Lesina Mattinata Peschici Rodi Garganico Vieste	BA BR LE TA FG 	 Isole Tremiti 	 FG
Sardinia	Budoni Carloforte Castiadas Domus de Maria Maracalagonis Muravera Pula Teulada Vullasimius Fordongianus	OT CI CA OR	La Maddalena	OT
Sicily	Aci Castello Acireale Catania Cefalù Monreale Terrasini Custonaci Erice San Vito lo Capo Trapani Giardini Nexos Letojanni Messina Taormina Licata Sciacca Modica Ragusa Portopale di Capo Passero Siracusa	CT PA TP ME AG RG SR 	 Favignana Malfa Lipari S,Marina Salina 	 TP ME
Trentino Alto Adige	Laives Lana Ortisei	BZ		
Tuscany	Asciano Buonconvento Casole d'Elsa Castellina in Chianti Castelnuovo Berardenga Chianciano Terme	SI		

	Chiusi			
	Colle di Val d’Elsa			
	Gaiole in Chianti			
	Montalcino			
	Montepulciano			
	Monteriggioni			
	Pienza			
	Poggibonsi			
	Radda in Chianti			
	Rapolano Terme			
	San Gimignano			
	San Quirico d'Orcia			
	Sarteano			
	Siena			
	Sovicille			
	Barberino del Mugello	FI		
	Bagno a Ripoli			
	Barberino Val d’Elsa			
	Borgo San Lorenzo			
	Calenzano			
	Campi Bisenzio			
	Capraia e Limite			
	Castelfiorentino			
	Cerreto Guidi			
	Certaldo			
	Dicomano			
	Empoli			
	Fiesole			
	Figline Valdarno			
	Firenze			
	Firenzuola			
	Fucecchio			
	Gambassi Terme			
	Greve in Chianti			
	Impruneta			
	Incisa in Val d’Arno			
	Lastra a Signa			
	Marradi			
	Montaione			
	Montelupo			
	Montespertoli			
	Palazzuolo sul Senio			
	Pelago			
	Pontassieve			
	Reggello			
	Rignano sull'Arno			
	Rufina			
	San Casciano in Val di Pesa			
	San Godenzo			
	San Piero a Sieve			
	Scarperia			
	Sesto Fiorentino			
	Signa			
	Tavarnelle Val di Pesa			
	Vicchio			
	Vinci			
	Bibbona	LI	Campo d’Elba	LI
	Campiglia Marittima		Capoliveri	
	Castagneto Carducci		Capraia Isola	
	Cecina		Marciana	
	Livorno		Marciana Marina	
	Piombino		Porto Azzurro	
	Rosignano Marittimo		Portoferraio	

	San Vincenzo		Rio Marina	
	Bucine	AR	Rio nell'Elba	
	Cavriglia			
	Cortona			
	Pergine Valdarno			
	Castiglione della Pescaia	GR	Isola del Giglio	GR
	Follonica			
	Gavorrano			
	Grosseto			
	Manciano			
	Scarlino			
	Lamporecchio	PT		
	Montecatini Terme			
	Londa	LU		
	Lucca			
	Pietrasanta			
	Viareggio			
	Massa	MS		
	Massa Marittima			
	Montignoso			
	Montescudaio	PI		
	Palaia			
	Pisa			
	Pontedera			
	San Giuliano			
Umbria	Monte Santa Maria Tiberina	PG		
	Orvieto			
	Perugia			
Valle d'Aosta	Antey-Saint- Andre	AO		
	Aosta			
	Arvier			
	Avise			
	Ayas			
	Aymavilles			
	Bard			
	Brissogne			
	Brusson			
	Challand-Saint- Anselme			
	Chamois			
	Champorcher			
	Charvensod			
	Châtillon			
	Cogne			
	Courmayeur			
	Donnas			
	Doues			
	Étroubles			
	Fénis			
	Fontainemore			
	Gaby			
	Gignod			
	Gressan			
	Gressoney-La- Trinite			
	Gressoney- Saint-Jean			
	Hône			
	Introd			
	Issime			
	La Salle			
	La Thuile			
	Lillianes			
	Montjovet			
	Morgex			
	Nus			

	Perloz			
	Pollein			
	Pontboset			
	Pont-Saint- Martin			
	Prè-Saint-Didier			
	Quart			
	Rhêmes-Notre- Dame			
	Rhêmes-Saint- Georges			
	Roisan			
	Saint- Christophe			
	Saint-Marcel			
	Saint-Nicolas			
	Saint-Oyen			
	Saint-Pierre			
	Saint-Vincent			
	Sarre			
	Torgnon			
	Valgrisenche			
	Valsavarenche			
	Valtournenche			
	Verrès			
	Villeneuve			
Veneto	Abano Terme	PD		
	Cittadella			
	Montegrotto Terme			
	Padova			
	Agugliaro	VI		
	Creazzo			
	Auronzo di Cadore	BL		
	Falcade			
	Livinallongo del Col di Lana			
	San Vito di Cadore			
	Bardolino	VR		
	Brenzone			
	Castelnuovo del Garda			
	Cavallino- Treporti			
	Costermano			
	Garda			
	Peschiera del Garda			
	San Zeno di Montagna			
	Torri del Benaco			
	Valeggio sul Mincio			
	Verona			
	Villafranca di Verona			
	Caorle	VE		
	Chiogghia			
	Eraclea			
	Jesolo			
	Quarto D'Altino			
	San Michele al Tagliamento			
	Venezia			
	Mogliano Veneto	TV		
	Preganziol			
	Rosolina	RO		
	Schio	VC		
	Vicenza			

Source: Author’s elaboration on Federalberghi data

Table A5.2 List of variables

Name	Definition	Period (years)	Type of variable	Source
Domestic tourist arrivals *(Dom_arrivals)*	Arrivals of resident in Italy tourists at a tourist accommodation establishment	2006-2011	Dependent	Provincial administration (Assessorato al Turismo)
International tourist arrivals *(Int_arrivals)*	Arrivals of non-resident in Italy tourists at a tourist accommodation establishment	2006-2011	Dependent	Provincial administration (Assessorato al Turismo)
Domestic nights of stay *(Dom_night)*	Nights spent by resident in Italy tourists in a tourist accommodation establishment	2006-2011	Dependent	Provincial administration (Assessorato al Turismo)
International nights of stay *(Int_nights)*	Nights spent by of non-resident in Italy tourists in a tourist accommodation establishment	2006-2011	Dependent	Provincial administration (Assessorato al Turismo)
Domestic length of stay *(Dom_length)*	Domestic arrivals/ Domestic overnight stays	2006-2011	Dependent	Author's elaboration
International length of stay *(Int_length)*	International arrivals/ International overnight stays	2006-2011	Dependent	Author's elaboration
Number of tourist accommodation *(Tot_accom)*	Total number of accommodation establishment	2006-2011	Predictor	ISTAT
Density *(Density)*	Density of population per square kilometre	2006-2011	Predictor	Author's elaboration
Coast *(Dcoast)*	Dummy variable that values one if a municipality is located in proximity of the coast and zero otherwise	time invariant	Predictor	Region of Sardinia
Tourist municipality *(Dtour)*	Dummy variable that values one if a municipality is defined by Sardinia Region as a tourist municipality and zero otherwise	time invariant	Predictor	Region of Sardinia
Distance from the airport *(Dist_airport_euro)*	Distance from a municipality to the nearest airport calculated in Euros	2006-2011	Predictor	www.maps.google.com
Distance from the port *(Dist_port_euro)*	Distance from a municipality to the nearest port calculated in Euros	2006-2011	Predictor	www.maps.google.com

Source: Author's elaboration

Table A5.3 Municipalities weights in the synthetic control

Municipalities in synthetic control	Arrivals		Nights		Length	
	Dom_	Int_	Dom_	Int_	Dom_	Int_
Assemini	0	0.016	0	0.013	0.007	0.019
Burcei	0	0.016	0	0.013	0.008	0.019
Cagliari	0	0.025	0	0.016	0.007	0.017
Capoterra	0	0.016	0	0.013	0.015	0.02
Castiadas	0	0.017	0	0.017	0.023	0.028
Dolianova	0	0.016	0	0.013	0.008	0.021
Domus de Maria	0	0.02	0	0.021	0.014	0.024
Mandas	0	0.016	0	0.013	0.005	0.016
Maracalagonis	0	0.016	0	0.013	0.049	0.027
Monastir	0	0.016	0	0.013	0.007	0.018
Muravera	0	0.021	1	0.024	0.035	0.025
Nuraminis	0	0.016	0	0.013	0.009	0.016
Ortacesus	0	0.016	0	0.013	0.006	0.02
Pula	0	0.263	0	0.35	0.015	0.024
Quartu S. Elena	0	0.02	0	0.017	0.011	0.021
Quartucciu	0	0.016	0	0.013	0.007	0.017
San Sperate	0	0.016	0	0.013	0.009	0.017
San Vito	0	0.016	0	0.013	0.008	0.018
Sarroch	0	0.016	0	0.013	0.014	0.029
Selargius	0	0.016	0	0.013	0.008	0.018
Senorbì	0	0.016	0	0.013	0.007	0.018
Sinnai	0	0.016	0	0.013	0.401	0.026
Teulada	0	0.017	0	0.014	0.021	0.021
Uta	0	0.016	0	0.013	0.007	0.019
Vallermosa	0	0.016	0	0.013	0.018	0.063
Villa S. Pietro	0	0.016	0	0.013	0.01	0.018
Villaputzu	0	0.017	0	0.015	0.066	0.033
Villasor	0	0.016	0	0.013	0.011	0.12
Calasetta	0	0.016	0	0.013	0.012	0.019
Carbonia	0	0.016	0	0.013	0.007	0.018
Carloforte	0	0.016	0	0.013	0.01	0.019
Iglesias	0	0.016	0	0.013	0.008	0.017
Portoscuso	0	0.016	0	0.013	0.009	0.018
Sant'Antioco	0	0.017	0	0.014	0.012	0.018
Sant'Anna Arresi	0	0.016	0	0.014	0.017	0.019
Bari Sardo	0	0.018	0	0.015	0.019	0.027
Cardedu	0	0.016	0	0.013	0.05	0.027
Gairo	0.044	0.016	0	0.013	0.009	0.021
Tortolì	0	0.02	0	0.019	0.02	0.023
Lotzorai	0	0.017	0	0.012	0.009	0.021
Alghero	0.956	0.085	0	0.112	0.013	0.021

Source: Author's elaboration

Final conclusions and further developments

The work focused on tourism externalities in Italy, specifically on the effect generated by tourism on crime, house prices and environment. After reviewing the literature and recent empirical evidence on other cases study in US and Europe, three main questions arose: 1) Does a positive relation exist between crime and tourism in Italy at provincial level?; 2) Does a positive link subsist between tourist sector and house prices in Italian cities?; and 3) Is the effect on tourist flows of the tourism taxation in an Italian tourist destination positive or negative?

As shown in this thesis, the topic of tourism externalities is relevant, in particular in a tourist country such as Italy. The previous empirical works have not provided an answer and the problem remains unsolved. Studies on the positive or negative externalities generated by tourism can be divided into two strands of research. On the one hand, studies examining perceptions of residents in a tourist destination from a merely descriptive point of view; on the other hand, applied econometric models analyzing and measuring the effects generated by tourism sector on socioeconomic and environmental variables. Therefore, excluding descriptive analysis, from an empirical perspective quantitative applications are rather heterogeneous. The review of empirical results shows that main negative externalities include: increase of crime rates; destruction of environment and natural amenities; Dutch disease. While the concept of *tourism led growth hypothesis* à la Balaguer and Cantavella-Jordà synthesizes positive externalities.

Not many studies explore for the case of Italy whether and to what extent crime and house prices are affected by tourism activity and if tourism taxation causes a decrease in tourist flows. Specifically, the present work applied econometric techniques to measure the intensity of such type of tourism externalities.

Results confirm initial intuitions for three cases examined. As far as crime is concerned, it is shown that tourism positively affects criminal activity; in the short run, a one-per-cent increase in arrivals leads to a 0.018% rise in total crime, while, in the long run, the impact is about 0.11%. In addition, it is performed a comparison between the crime elasticity of residents and tourists, by re-estimating the model using the level of total crime instead of the rate of crime and equivalent tourist population (by replacing the tourist arrivals variable with nights of stay/365). Findings show that the impact of resident population is higher than the one of the tourists and the difference between the coefficients associated with residents and tourists is significantly different from zero.

The analysis on house prices provides some initial evidence that overall for the case of Italy, tourism has a positive and significant effect on house price levels.

Results are confirmed by several robustness checks. In addition, by comparing the city center, suburban and peripheral locations no great variations of these effects are found. Nevertheless, the positive link between tourism and house prices in Italy needs to be interpreted cautiously because cities in Italy are very different. Further investigation on this direction has given several hints on the existence of potential different tourism-house price relationships for types of cities. A possible extension of the present work is to see whether and to what extent this relationship is positive, negative or even not significant for the cities under investigation. This specific analysis requires the use of other types of estimators such as the mixture models that search for different regimes in the relationships under analysis.

The purpose of a tourism tax is to both generate local public revenues and to correct market failures. The present analysis has adopted a Synthetic Control Method to investigate the impact of the tourism tax applied on the tourism demand in the municipality of Villasimius in Sardinia. This study can be considered as a first attempt to evaluate the strengths and weakness of this policy: on the one hand, Villasimius obtains further local public revenues that can be allocated to protect the environment, promote the municipality as a tourist destination, and improve the quality of services during the tourism season however, on the other hand, the municipality may suffer some costs due to the price competition of other tourism destinations. The empirical evidence has suggested that the effect of the policy can be differentiated by separately investigating domestic and international demand. Results demonstrated that for the international component the tax did not have distortive effects; while the domestic component some problems appeared in the statistics for arrivals and nights of stay. Nevertheless, the robust results for the domestic length of stay have been not so clear. This outcome needs to be further investigated by employing causal econometrics modelling, such as panel data, where it is more likely to capture the role played by other determinants.

It will be useful to investigate whether these results found in Italy are reflected also in other European countries, such as for instance France and Spain. As a consequence, further research on this topic is needed.

This research has policy implications as urban and regional economists. As far as crime and house price are concerned, specific policy could be taken into account in different cities, according to the level of tourism development.

In terms of policy evaluation of tourism taxation, is currently planned to further extend the analysis with data on 2012 and 2013 when made available by the regional statistics office. Furthermore, the same methodology could be applied in other Italian cities where it is levied the tourism tax.

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