Tourism, amenities, and welfare in an urban setting *

Gianandrea Lanzara[†] and G. Alfredo Minerva[‡]

January 31, 2019

Abstract

Using data on Italian cities, we document that over the period 2001 – 2011 the number of establishments and employment in some key services industries are positively related to the inflow of tourists. We then build a general equilibrium model of small open cities encompassing these empirical features to study the impact of tourism on endogenous consumption amenities, factors' allocation across sectors, prices, and welfare. We also study the interplay of exogenous historical amenities, tourism and residents welfare in a system of two cities. When residents are immobile they are unambiguously better off when they live in a city with richer historical amenities, and thus more tourists, than the other city. When residents are mobile and their welfare is equalized between cities, the strength of consumption amenities becomes crucial to determine whether they are better off living in an urban system where cities are heterogeneous or similar in terms of historical amenities.

JEL Classification: R13; R31; R32; Z30; Z32.

Keywords: City; Consumption Amenities; Real Estate; Tourism; Welfare.

*We thank participants to the 11th Meeting of the Urban Economics Association in Minneapolis, the 2016 ASSET Meeting in Thessaloniki, and the Journal of Regional Science symposium on Endogenous Amenities and Cities in Tallahassee for useful comments. We are also indebted to an anonymous referee, Mikhail Dmitriev, Gianmarco Ottaviano and Lorenzo Zirulia for many precious remarks.

[†]University of Bologna. E-mail: gianandrea.lanzara3@unibo.it

[‡]Corresponding author. University of Bologna and Centro Studi Luca d'Agliano. E-mail: ga.minerva@unibo.it

1 Introduction

Tourism may be an important determinant of urban success, providing a powerful stimulus to urban growth and development. For instance, Carlino and Saiz (2008) show that the number of leisure visits to a city is one of the key predictors of its economic success. However, as tourist inflows rise, many cities are also experiencing rising land and consumption prices. Performing the evaluation of policies aimed at attracting tourists in a certain destination requires to understand exactly the impact of tourism on several city variables and, ultimately, on the welfare of the resident population.

In this paper, we study how tourism affects cities through the lens of urban economics. Using data on Italian cities, we first document that, over the period $2001-2011$, the number of establishments and the level of employment in services are positively related to the inflow of tourists. To address these patterns, we build a model with endogenous consumption amenities, price and real income effects, and two sectors of production (a tradable intermediate sector and a non-tradable services sector).

Consumption amenities come in the form of product variety in the services sector, where horizontally differentiated firms engage in monopolistic competition. These firms are retail shops, restaurants, and other economic activities linked to a thriving services sector. Real income effects arise because residents are at the same time wage earners, land owners and consumers, and wages, land prices and consumption prices are determined endogenously through market clearing. Tourism exerts a demand pressure on the land market, on the labor market, and on the market for services, inducing general equilibrium effects on all these variables. Furthermore, when tourists are mobile across alternative destinations, spatial equilibrium effects arise. We characterize the spatial equilibrium in a simple system of two cities. First, we study the model under the assumption that the resident population is immobile, whereas tourists can freely choose between the two destinations. In a second exercise, we allow residents to relocate as well.

Our paper addresses some important issues about the impact of tourism in an urban setting. First, on the positive side, we show how tourism changes the sectoral composition of the local economy. We find that, as the number of tourists increases, the city undergoes a structural transformation away from the tradable sector, and specializes in services. Cities with a higher number of tourists have higher land prices, higher prices for services goods, and a larger number of services varieties.

As a second contribution, we determine the endogenous spatial distribution of agents between two cities, given the total number of tourists and residents. When residents are immobile, we derive a simple formula to pin down the share of tourists in a city, as a function of the value of historical amenities, plus other characteristics, in both cities. When residents are mobile, the share of tourists and the share of residents in a city are determined jointly. In our simulations, consistently with the empirical evidence in Carlino and Saiz (2008), we find that the number of residents and tourist visits in a city are positively correlated. Then, cities with rich historical amenities are predicted not only to be more specialized in services, but also to be larger in terms of population, than similar cities with poor historical amenities.

Finally, as a third contribution, we study how tourism affects the resident population in terms of welfare. We show that, if residents are immobile, they always gain from an increase in the number of tourists, either exogenous in the single-city case, or endogenous in a system of two cities as a consequence of more historical amenities. When residents are mobile, the strength of consumption amenities can make them best off in an urban system where cities are homogeneous in terms of historical amenities and are visited by a similar number of tourists.

Our paper is related to the following strands of literature. First, we contribute to the economic literature on urban amenities. Glaeser *et al.* (2001), who introduced the concept of "consumer city", argue that two types of amenities are particularly important for urban success. On the one side, cities offer a rich variety of services and non-tradable consumer goods; on the other side, all attributes related to the aesthetics and the physical setting play an important role, since they are increasingly valued by consumers. In our terminology, the former falls in the category of endogenous amenities, whereas the latter falls in the category of exogenous amenities. Our paper builds on the importance of amenities for urban success, and presents an integrated framework to study how tourism affects urban amenities and real incomes, the implications for the welfare of residents, and how endogenous and exogenous amenities interact at the urban level. On the empirical side, there is a number of papers that study the link between the composition of local demand and product diversity. For instance, Waldfogel (2008) finds that the demographic mix of the population (i.e. ethnicity, income, education) affects the type of available restaurants across U.S. ZIP codes. Mazzolari and Newmark (2007) also find that the share of immigrants is related to the share of ethnic restaurants across Census tracts in California. Finally, Schiff (2015) finds that larger and denser markets offer both greater variety and rarer varieties of restaurants. Consistently with this literature, we document that in our data tourism and the number of restaurants and retail shops are correlated across Italian cities. Our theoretical findings are also consistent with Carlino and Saiz (2008), who show that the number of leisure visits to a city provides a good revealed-preference measure of local leisure amenities. Finally, in Lee (2010) land prices and consumption amenities shape the sorting pattern of high-skilled and low-skilled workers across cities, thus contributing to explain the urban wage premium.

Second, as far as the spatial equilibrium analysis is concerned, our model builds on the Rosen-Roback framework and on the related literature that studies the distribution of agents across cities. In the standard framework (Rosen, 1979; Roback, 1982) urban amenities affect the utility of residents directly, and residents relocate across cities to level out welfare differentials. In our model, the economic mechanism is more complex. In fact, we show that exogenous amenities may have an impact on urban outcomes and welfare even when residents are not directly interested in them; the reason is that they enter the utility function of a second class of agents, namely tourists, whose demand for land and services triggers a surge in land prices and product variety in the urban system. Extensions of the classic Rosen-Roback framework have been developed to explain the sorting of heterogeneous agents across cities (Lee, 2010). We also find that residents and tourists sort between cities in the urban system, in the sense that the ratio of residents over tourists is not constant across cities. Rather, depending on exogenous parameter values, cities may become more tourist-oriented or resident-oriented.

Finally, a third strand of literature that is related to our paper is the one about the impact of tourism on a local economy. Our baseline results are related to Copeland (1991), who studies a small open economy and presents two main findings: first, the welfare impact of tourism is positive, as long as it increases the relative price of non-tradables; second, under certain conditions tourism can lead to a contraction of the manufacturing sector in favour of the services sector. Chao et al. (2006) provide a similar analysis in the context of a dynamic macro model. In a recent paper, Faber and Gaubert (2017) find a positive welfare impact of tourism on the Mexican economy, using a structural spatial framework that includes productivity spillovers between the services and the manufacturing sector. We cast the discussion about the impact of tourism in an urban context that features exogenous historical amenities and endogenous consumption amenities.

The remainder of the paper is structured as follows. Section 2 presents some empirical patterns that we aim to replicate in in the model. Section 3 presents the baseline model. In section 4 we generalize the model to a system of two cities. We then present in section 5 some further extensions to our setting. Finally, section 6 concludes.

2 Empirical patterns

In this section, we document the empirical association between tourism and some key economic variables across Italian municipalities, over the time period 2001 − 2011. Although these patterns should not be interpreted as causal effects, they provide motivation for the theoretical analysis that we develop in the following sections. At the same time, we ground our specifications in the functional forms that we derive from the model.

Our data come from two main sources. First, we use Italian Census data for years 2001 and 2011. The Industry and Services Census provides information on the number of establishments and the number of employees in each sector for all Italian municipalities, with sectors defined following the NACE classification. We complement this data set with the total resident population from the Population Census. Second, data on tourism activity come from the Annual Survey of the Capacity of Tourist Accommodation Establishments. This survey provides the number of overnight stays at the province level,[1] and the number of beds (a measure of capacity) at the municipality level. First, we allocate the number of overnight stays to each municipality proportionally to its relative within-province capacity. Second, in order to provide a measure of tourism in resident-equivalent terms, we divide the number of overnight stays by 365 (assuming that each resident spends 365 nights in his place of residence). Then, we construct our main explanatory variable as the number of tourists per 1000 residents at the municipality level.[2]

The basic specification we run is

$$\Delta y_{ij} = \alpha + \delta_1 \Delta \text{tourism}_{ij} + \delta_2 x_{ij} + \mu_j + \epsilon_{ij},$$

where: Δy_{ij} is the absolute change in the dependent variable of interest from 2001 to 2011 in municipality i within province j; $\Delta\text{tourism}_{ij}$ is the main explanatory variable, the absolute change in the number of resident-equivalent tourists per 1000 residents from 2001 to 2011 in municipality i in province j; x_{ij} is a set of controls, including total municipal land area, average elevation, and

[1] The province level corresponds to NUTS 3 in terms of the European geographical classification.

[2] We provide more information on the data used in Appendix A.1.

a dummy for coastal towns; μ_j is a set of 103 dummies, one for each province; ϵ_{ij} is the error term. Note that first differences control for all time-invariant factors that affect the level of y_{ij} at the municipality level; moreover, province dummies ensure that our variation comes from comparing municipalities within narrow and homogenous spatial units. We trim our data set in order to exclude municipalities with extremely low or high values for our main regressor $\Delta \text{tourism}_{ij}$.[3] The resulting empirical density function is depicted in figure 1.

[Insert Figure 1 about here]

Table 1 reports the descriptive statistics for the main variables used in the analysis, for our base year (2001) and for the change over the subsequent decade (2001-2011). A first observation that emerges from the table is that the spatial distribution of tourism is uneven. In 2001, on average, there were 19 tourists per 1000 residents in Italian municipalities, whereas the median was 1.5, and the 75th percentile was 8.4. Therefore, most municipalities host a small number of tourists, while a few municipalities host a large number of tourists.

[Insert Table 1 about here]

Second, the number of tourists over 1000 residents increased (by 1.7 units) over our period of study; however, as shown in figure 2, this number masks a steep decline for the top 10% destinations (as of 2001), and a mild increase along the rest of the distribution, especially for the 8th and 9th deciles. For this reason, we run our main regressions both on the full sample and excluding the top-decile municipalities. Moreover, the number of hotels per 1000 residents and the number of restaurants and bars per 1000 residents increased, whereas the number of retail stores per 1000 residents decreased. A similar pattern emerges in terms of employment (the average change in employment in retail stores is small and positive, while the corresponding median change is small and negative).

[Insert Figure 2 about here]

In table 2 we report the results on tourism and the number of establishments for the different industries in our sample. We report in panel A the correlation between the change in the number of tourists per 1000 residents from 2001 to 2011 and the change in the number of establishments

[3] We drop municipalities belonging to the top 1% and bottom 1% of the distribution.

per 1000 residents over the same time period for the full sample of municipalities. We focus on industries that, in our view, represent important urban consumption amenities, both for residents and tourists: restaurants and bars (column 2), and different types of retail trade stores (columns 3-8); in the last column, we also report results for the tourist accommodation sector. The coefficients reported show that tourism is positively associated with the number of restaurants and bars, and with the total number of retail shops. For instance, in the case of Venice, back-of-the-envelope calculations predict that the increase in restaurant and bars in the 2001-2011 period that can be related to the inflow of tourists is roughly equal to 80 establishments. Census data show that the total increase of business units in industry 56 over the same period of time amounts to 374. For Florence, which experienced a much lower increase in tourism, we predict an increase of 14 restaurant and bars related to the tourists inflow, while the overall increase coming out from Census data totals 425 business units. In columns 4-8, we break down the 2-digit retail shops sector into its main 3-digit subsectors.[4] There is a positive and significant correlation for specialized food shops, books, sport, toys, and clothing and footwear. As expected, the number of accommodation establishments is also positively related to the change in the number of tourists.

[Insert Table 2 about here]

Panels B and C of table 2 check the robustness of these correlations. In panel B we show the results of the same regression, excluding the municipalities in the top decile of the tourists distribution in 2001. Results are broadly consistent. In panel C, as a second robustness check, we exclude municipalities with zero tourist density in either 2001, or 2011, or both years. Again, results are consistent, except in the regression on the number of food and beverages stores, where the coefficient is now insignificant. How can we interpret the heterogeneity across industries? For example, why does tourism correlate with the number of specialized food shops but not with the number of non-specialized stores? And why is the coefficient on clothing and footwear higher than the coefficient on books, sport, and toys? Our model shows in section 3 that the coefficient linking the number of establishments to the tourist flow should be smaller when economies of scale are large.

In table 3 we replicate table 2, using as a dependent variable the change in city employment between 2001 and 2011, normalized by the resident population, for the same set of industries. The

[4] We exclude from the analysis gas stations, ICT retail shops, retail sale via mail orders or via Internet, and second-hand market sales.

correlation is positive for restaurant and bars, and for the total number of employees in retail stores, confirming that municipalities that experienced stronger tourism inflows also specialized more towards the sectors producing urban consumption amenities. The effect is statistically significant for the books, sport, toys, and clothing and footwear industries.

[Insert Table 3 about here]

3 The baseline model

In the baseline model, the city consists of a fixed resident population, n_R, and a fixed amount of land, H, which is used both for residential and for commercial purposes. Each resident supplies inelastically one unit of labor, so that total labor force is equal to n_R, and she is entitled to an equal share of the total land rents paid in the city. The number of tourists visiting the city is n_T. In this section, we take n_R and n_T as exogenously given. In section 4, we study how n_R and n_T are endogenously determined in a two-city system.

3.1 Preferences

Both residents ($i = R$) and tourists ($i = T$) have a Cobb-Douglas utility function defined over a bundle of non-tradable services and land:

$$U_i = A_i \left(\frac{C_i}{\gamma}\right)^{\gamma} \left(\frac{h_i}{1-\gamma}\right)^{1-\gamma}, \qquad 0 < \gamma < 1,$$

where A_i is a utility shifter (the amenity level provided by the city), C_i is a bundle of differentiated non-tradable services, h_i is land consumption, and γ is the share of income allocated to non-tradable services consumption. We follow the standard Dixit-Stiglitz formulation, and assume that C_i is a CES aggregate of a continuum of differentiated varieties:

$$C_i = \left(\int_0^m c_{ij}^{\varepsilon} dj\right)^{\frac{1}{\varepsilon}}, \qquad 0 < \varepsilon < 1,$$

where ε is the elasticity of substitution between different varieties and m is the mass (hereafter, number) of varieties supplied by the non-tradable sector. We set $A_R = 1$ to simplify the model and leave only $A_T = A$ to matter in the baseline analysis.[5] A is an index broadly interpreted

[5]Tourism may affect the resident population through increased commuting times, noise, congestion on public transportation, etc. These issues represent a form of non-market congestion, and we include them into an extension to the baseline model. Our model already features some congestion effects in the form of higher prices, so we prefer to leave out of the baseline model non-market congestion.

as those exogenous features of a city (monuments, museums, parks, etc.) that attract tourists. Let us call them historical amenities (this term may also include natural amenities). The mass of varieties m of the services sector plays in our setting the role of a consumption amenity. In fact, *ceteris paribus*, under Dixit-Stiglitz preferences consumers' welfare is increasing in the number of differentiated varieties supplied by the market. We think of m as the number of restaurants, retail shops, and other activities connected with a thriving services sector. This number makes a city more or less attractive, and is endogenously determined. In our model, consistently with the empirical patterns we have documented, this number is related to the number of tourists visiting the city.

Some comments are in order about the preference structure. First, we assume that residents and tourists consume the same goods.[6] Second, we assume that residents and tourists devote the same share of their budget to land consumption. Residents budget coincides with their income, while in the case of tourists it has to be interpreted as the budget devoted to the holiday. Third, assuming that all tourists consume land, we neglect the role of day-trippers.

Residents and tourists maximize utility subject to the budget constraint, which is given by:

$$\int_0^m p_{sj} c_{ij} dj + q h_i \leq I_i = \begin{cases} w + \frac{qH}{n_R} & \text{for } i = R \\ I_T & \text{for } i = T \end{cases}$$

where p_{sj} is the price of one unit of non-tradable services purchased from firm j, w is the wage rate, q is the price of one unit of land, so that qH/n_R are land rents earned by a resident. I_T is the exogenous tourist holiday budget to be spent on the non-tradable sector and accommodation. In our model there is a unique labor market with perfectly mobile workers, and consequently the equilibrium wage rate is unique. Taking the first-order conditions, individual demands are given by:

$$\begin{aligned} c_{ij} &= p_{sj}^{-\frac{1}{1-\varepsilon}} P_s^{\frac{\varepsilon}{1-\varepsilon}} \gamma I_i, \quad j = 1...m, \\ h_i &= (1-\gamma)\frac{I_i}{q}, \end{aligned} \tag{1}$$

where P_s is the price index in the non-tradable sector, $P_s = \left(\int_0^m p_i^{\frac{-\varepsilon}{1-\varepsilon}} di\right)^{-\frac{1-\varepsilon}{\varepsilon}}$. Aggregate demand

[6]It can be argued that the consumption basket of residents and tourists is actually quite different. In the polar case where residents and tourists consume two disjoint sets of differentiated varieties (so that one sector supplies differentiated varieties to residents, and another sector supplies differentiated varieties to tourists) it is possible to show that, in aggregate terms, the model keeps the same equilibrium properties as in the baseline case. We show this extension to the model in the Online appendix.

for non-tradable variety j is given by:

$$n_R c_{R,j} + n_T c_{T,j} = p_{js}^{-\frac{1}{1-\epsilon}} P_s^{\frac{\varepsilon}{1-\varepsilon}} \gamma(wn_R + qH + n_T I_T). \tag{2}$$

As far as the price of each non-tradable services variety is the same (something that we show to be true at equilibrium) the indirect utilities of residents and tourists are:

$$V_R = m^{\frac{\gamma(1-\varepsilon)}{\varepsilon}} \frac{w + q\frac{H}{n_R}}{p_s^{\gamma} q^{1-\gamma}}, \tag{3}$$

$$V_T = A_T m^{\frac{\gamma(1-\varepsilon)}{\varepsilon}} \frac{I_T}{p_s^{\gamma} q^{1-\gamma}}, \tag{4}$$

where p_s is the equilibrium price of differentiated varieties. Residents and tourists welfare are linked in a positive manner to two endogenous components: first, they are linked to the number m of non-tradable services varieties, due to the *love of variety effect* peculiar to our preference structure; second, they are linked to residents *real income* and tourists *real holiday budget*, since nominal quantities I_R and I_T are deflated by the price index $p_s^{\gamma} q^{1-\gamma}$. At equilibrium, the number of tourists will influence welfare through all these channels. Moreover, note that the nominal income of residents, $I_R = w + \frac{qH}{n_R}$, depends on wages and land prices. Instead, tourist nominal holiday budget, I_T, is fixed; however, in equilibrium also the tourist real holiday budget does respond to the number of tourists via the effect on prices.

3.2 Production

In the city there are two sectors: a differentiated non-tradable sector (non-tradable services) and a homogenous intermediate sector, whose output is used in the production of non-tradable services and freely traded on world markets. We choose the homogenous good as the numeraire of the economy.

The non-tradable sector, indexed by s, is characterized by monopolistic competition. Each variety j is produced according to a Cobb-Douglas production function that combines labor, land, and the intermediate input under constant returns to scale. Therefore, output for each variety is equal to

$$y_{sj} = a_s l_{sj}^{\alpha_s} h_{sj}^{\beta_s} y_{kj}^{1-\alpha_s-\beta_s},$$

where a_s is the TFP in the non-tradable sector common to all firms, l_{sj} is labor, h_{sj} is land, and y_{kj} is the quantity of intermediate input employed by firm j. To enter the non-tradable sector, firms need a fixed requirement of η units of the intermediate input. In the absence of strategic interactions, the firm maximizes its profits subject to aggregate demand for the single variety, (2), taking the aggregate price index, P_s as given. The first order conditions for the firm problem are:

$$\begin{aligned} \varepsilon\alpha_s p_{sj}\tfrac{y_{sj}}{l_{sj}} &= w, \\ \varepsilon\beta_s p_{sj}\tfrac{y_{sj}}{h_{sj}} &= q, \\ \varepsilon(1-\alpha_s-\beta_s) p_{sj}\tfrac{y_{sj}}{y_{kj}} &= 1. \end{aligned} \tag{5}$$

Furthermore, free entry into the non-tradable sector ensures that in equilibrium all firms make zero profits:

$$\pi_{sj} = p_{sj}y_{sj} - wl_{sj} - qh_{sj} - y_{kj} - \eta = 0. \tag{6}$$

Clearly, given that all non-tradable firms share the same production function with the same TFP, they will charge the same price in equilibrium, $p_{sj} = p_s$ for all $j = 1, ..., m$, and demand the same amount of production factors. From the conditions in (5) we get that the price of a differentiated variety is equal to the marginal cost times a mark-up term,

$$p_s = \frac{w^{\alpha_s} q^{\beta_s}}{\varepsilon\kappa_s a_s},$$

where $\kappa_s < 1$ is a constant.[7] From now on we drop subscript j. Aggregate labor demand in sector s is then given by $L_s = \int_0^m l_{sj}dj = ml_s$. Aggregate land demand (H_s) and intermediate input demand (Y_k) can be expressed in a similar way.

The intermediate sector, indexed by k, operates under constant returns to scale and uses labor only. The production function is $Y_k^o = a_k L_k$, where a_k is the TFP in the intermediate sector. Under our assumption of a single labor market, with workers freely mobile between sectors, and as long as $L_k > 0$, the wage rate is fixed and equal to the marginal revenue in the intermediate sector, $w = a_k$.

[7] See appendix A.2 for the values of some constants, and appendix A.3.1 for the derivation of p_s.

3.3 Equilibrium

There are four markets in our model: non-tradable services, land, labor, and the intermediate input. Equilibrium in each market requires:

$$n_R c_R + n_T c_T = y_s \qquad \text{(non-tradable market)} \qquad (7)$$

$$n_R h_R + n_T h_T + m h_s = H \qquad \text{(land market)} \qquad (8)$$

$$m l_s + L_k = n_R \qquad \text{(labor market)} \qquad (9)$$

$$m(y_k + \eta) = Y_k^o + X \qquad \text{(intermediate input)} \qquad (10)$$

where X are net aggregate imports of the intermediate input. In the market clearing conditions, we use the property of firm symmetry in the non-tradable sector. Equations (1), (5), (6), condition $w = a_k$, and equations (7) – (10) characterize the general equilibrium in the city.

Market clearing and the zero-profit condition in the non-tradable sector imply that $n_T I_T = X$.[8] This condition is a current account balance condition between the city and the rest of the world. It says that tourist expenditure that flows into the city has to be perfectly matched by payments on the intermediate input that flow out of the city, due to net imports.

In our model an expansion in tourism leads the city to produce more in the services sector. To show this, we derive an expression for the share of the labor force in the services sector as a function of the number of tourists:[9]

$$\frac{L_s}{n_R} = \frac{\alpha_s \varepsilon}{1 - \beta_s \varepsilon} \left(1 + \frac{n_T I_T}{w n_R} \right). \qquad (11)$$

As long as $L_k > 0$, so that $w = a_k$, this expression pins down L_s/n_R as a function of n_T/n_R. It says that, relative to the residents population, the labor force employed in the non-tradable sector is increasing in the number of tourists who visit the city.

Proposition 1. *The share of the labor force employed in the services sector, L_s/n_R, is increasing in the share of tourists in a city, n_T/n_R.*
When the number of tourists is greater than a threshold $\hat{n}_T$ the city becomes fully specialized in non-tradable services, that is, $L_s/n_R = 1$.

The economic intuition behind this result is simple, and it is related to the economic literature on tourism and the Dutch disease – see, for instance, Copeland (1991), Chao *et al.* (2006). Since

[8] See appendix A.3.2.

[9] See appendix A.3.3.

services are not tradable, increased tourist demand pushes up revenues in the non-tradable sector, whereas the price for the intermediate input is fixed on world markets. Hence, the economy moves factors of production to the non-tradable sector and substitutes the domestic production of the intermediate input with imports. Table 3, in section 2, presents empirical evidence that is consistent with Proposition 1.

When the number of tourists is greater or equal than $\hat{n}_T$, the intermediate sector disappears and the city economy becomes fully-specialized in the non-tradable sector. Setting $L_s = n_R$ in (11), we derive $\hat{n}_T$:

$$\hat{n}_T \equiv \frac{1-(\alpha_s+\beta_s)\varepsilon}{\alpha_s\varepsilon}\frac{a_k n_R}{I_T}.$$

This threshold is increasing in the productivity of the intermediate sector, a_k, and in the resident population, n_R. Therefore, larger cities, as well as cities where the intermediate sector is more productive, can host a larger number of tourists before full specialization is reached. To get a sense of the magnitude of this threshold, let us provide a simple parametrization. Following the estimates of Valentinyi and Herrendorf (2008) for the services sector, we set $\alpha_s = 0.65$ and $\beta_s = 0.2$. Given there is no construction sector in our model, we include both land and structures into the factor of production land. Also, we set the elasticity of substitution between services varieties $\frac{1}{1-\varepsilon} = 4$, implying $\varepsilon = 0.75$. Given these values, the share of tourists over residents such that cities become fully specialized in services, $\frac{\hat{n}_T}{n_R}$, is equal to a fraction 0.74 of $\frac{a_k}{I_T}$, the ratio of local wages over tourist holiday budget. Data show that the level of wages is similar to annualized tourist expenditure, and this implies that the cutoff for full specialization is high. Therefore, the model suggests that only under special circumstances should we observe full specialization in the services sector at the city level.[10] In the rest of the analysis we concentrate on a partially-specialized city, assuming that $n_T < \hat{n}_T$.

We can now complete the description of the equilibrium. The equilibrium number of firms in

[10] According to Istat (2017a) median disposable income in Italy was 16,115 euros in 2015 for a single person. According to Istat (2017b) average daily expenditure by Italian tourists for a holiday in Italy was 78 euros in 2015, which corresponds to an annual equivalent of 28,470 euros. Back-of-the-envelope calculations show that in this case a share equal at least to 0.42 tourists per resident is needed to get full specialization. In our sample of roughly 8,000 Italian municipalities, in year 2001 the ratio $\frac{n_T}{n_R}$ has a mean of 0.03, and exceeds 0.42 in about 100 municipalities, being mostly seaside and mountain resorts.

the non-tradable sector is:

$$m = \kappa_m \frac{a_k n_R + n_T I_T}{\eta}, \tag{12}$$

with κ_m being a constant. The equilibrium land price is:

$$q = \kappa_q \frac{a_k n_R + n_T I_T}{H}, \tag{13}$$

with κ_q being a constant.[11] Due to the Cobb-Douglas assumption on both utility and production, the non-tradable sector always employs a constant fraction of the city land, regardless of the number of tourists in the city:

$$H_s = \frac{\beta_s \varepsilon \gamma}{1 - \gamma + \beta_s \varepsilon \gamma} H.$$

Finally, the equilibrium price for non-tradable services varieties is:

$$p_s = \kappa_p \frac{a_k^{\alpha_s}}{a_s} \left(\frac{a_k n_R + n_T I_T}{H} \right)^{\beta_s}, \tag{14}$$

where κ_p is a constant. Let us make some comments about the relationships we derived so far. First, note that the variables m, q and p_s are strictly increasing in n_T. Second, and more importantly, note that whereas m and q are linear in the number of tourists, p_s is a concave function. As we will show, this result has important implications for the welfare impact of tourism. Finally, as far as m is concerned, Table 2 in section 2 presents empirical evidence that is consistent with equation (12).

3.4 Welfare

What is the impact of tourism on the welfare of residents? The number of tourists affects the welfare of residents through the level of consumption amenities and the change in real income. The effect on consumption amenities is always positive – see equation (12): tourism boosts growth in services, increasing the number of available varieties. In contrast, the sign of the real income effect is not obvious: as tourists flow into the city, the resident population earns better rents (wages are fixed under partial specialization), but also faces higher consumption prices. The following proposition characterizes the impact of tourism on the welfare of residents.

Proposition 2. *The welfare of residents, V_R, is always increasing in the number of tourists, n_T.*

[11] See appendix A.3.4.

Proof. See Appendix A.4.1. □

Residents welfare depends on consumption amenities and real income. In turn, real income depends on real wages and real land income. Resident nominal wages are fixed, so that the impact of tourism runs through land prices only. The effect of tourism on real land income is always positive: nominal land income rises linearly with the number of tourists, whereas the price index $p_s^{\gamma} q^{1-\gamma}$ is concave. The effect of tourism on real wages is always negative, but the positive real land income and consumption amenity effects prevail. Therefore, the total welfare effect of tourism on residents is positive.[12]

Let us now turn to the welfare of tourists. Again, the effect going through consumption amenities is positive. In contrast, the real income effect is always negative, as tourist budget is fixed at I_T and doesn't adjust to the tourism-related hike in prices. Which of the two effects prevails? The following proposition shows that tourists are worse off in tourism-crowded cities as long as the services sector is weakly differentiated.

Proposition 3. *The welfare of tourists, V_T, is decreasing in the number of tourists, n_T, if and only if*

$$\varepsilon > \frac{\gamma}{1 + \beta_s \gamma} \equiv \hat{\varepsilon}.$$

Proof. See Appendix A.4.2. □

The economic intuition behind this result is simple. When the elasticity of substitution, ε, is sufficiently high, the gains from variety are low and the negative real income effect prevails. In this case, the impact of tourism on the welfare of tourists is negative. However, provided that ε is sufficiently low, the gains from variety overcome the real income losses, and an increase in the number of tourists, n_T, brings a positive effect on the welfare of tourists. In the remainder of the paper, we say that consumption amenities are *strong* when $\varepsilon \leq \hat{\varepsilon}$ (strongly differentiated services sector), and that consumption amenities are *weak* when $\varepsilon > \hat{\varepsilon}$ (poorly differentiated services sector).

[12] Proposition 2 is related to the result in Copeland (1991), that tourism improves welfare, since an increase in the price of non-tradables amounts to a terms-of-trade improvement. In our setting tourism increases the price of land with respect to the price of the tradable intermediate input, which is fixed on international markets. However, our model also features monopolistic competition in the services sector; thus, it allows to shed light on endogenous consumption amenities.

As a final comment, we stress the role of nominal income for the results of this section. When nominal income is fixed as with tourists, tourism may increase or decrease welfare, depending on the strength of consumption amenities. In contrast, when the nominal income is free to adjust as with residents through land prices, tourism always increases welfare.

4 Amenities and welfare in a system of two cities

In this section, we study the spatial equilibrium of tourists across alternative destinations. The parameter A, the level of historical amenities, is going to play a role in this section: since A enters the welfare of tourists, tourists' mobility creates a link between local historical amenities and the endogenous variables of the model, including consumption amenities and the welfare of residents. Cities with a rich historical heritage attract more tourists, and therefore have higher land prices, consumption prices, and a larger services sector, with a higher number of varieties. We focus on a simple system of two cities that differ in terms of four exogenous parameters: the level of historical amenities enjoyed by tourists, the TFP of the tradable and non-tradable services sectors, and the stock of land. Both cities are small open economies that can freely trade with each other and with the rest of the world. Thus, as in the baseline case, the price of the tradable good is fixed on international markets and normalized to 1. Concerning the resident population, we consider two polar assumptions. First, we assume that residents are immobile. Second, we assume they are freely mobile between the two cities, with the total number of residents in the urban system being exogenous and equal to N_R. Our approach is in the spirit of the Rosen-Roback classic framework (Rosen, 1979; Roback, 1982), with the difference that, in our model, there are two groups of mobile agents: tourists and residents. Our model is also related to Anas and Pines (2008), who study the consequences of congestion in a system of two cities; however, whereas they model a *closed* urban system, we consider an *open* urban system, where a tradable good may be exchanged with an outer economy. In fact, given that tourist expenditure is exogenous in our setting, we require cities to import goods from the rest of the world in order to maintain the equilibrium on the balance of payments.

We focus on the case where both cities are partially specialized in non-tradables, even when all tourists head to the same city, and consumption amenities are weak.[13]

[13] In formal terms we are assuming that $N_T < min[\widehat{n}_{T,1}, \widehat{n}_{T,2}]$ and $\varepsilon \geq \hat{\varepsilon}$. In the Online supplementary material we present the results for strong consumption amenities and immobile residents: in this case, apart from a knife-edge

4.1 Spatial equilibrium with immobile residents

Let ϕ_T denote the fraction of the total tourist population choosing city 1, $n_{T,1} = \phi_T N_T$. Tourists are freely mobile between the two destinations, whereas residents are immobile. We may have either an interior equilibrium where tourists visit both cities, or corner solutions where all tourists agglomerate in one of the two cities. Therefore, the spatial equilibrium requires:

$$\Delta V(\phi_T) \equiv V_{T,1}(\phi_T) - V_{T,2}(\phi_T) = 0, \quad \text{and} \quad 0 < \phi_T < 1 \tag{15}$$

$$\text{or} \qquad \Delta V_T(\phi_T) \leq 0, \quad \text{and} \quad \phi_T = 0$$

$$\text{or} \qquad \Delta V_T(\phi_T) \geq 0, \quad \text{and} \quad \phi_T = 1$$

meaning that no tourist has an incentive to change his choice of destination. This first condition characterizes the interior equilibrium, and the latter two the corner solutions. The interior equilibrium exists and is unique if and only if

$$\frac{\partial \Delta V_T(\phi_T)}{\partial \phi_T} < 0 \quad \text{for} \quad 0 < \phi_T < 1, \tag{16}$$

$$\Delta V_T(0) > 0, \tag{17}$$

$$\Delta V_T(1) < 0. \tag{18}$$

When the non-tradable sector supplies poorly differentiated varieties ($\varepsilon > \hat{\varepsilon}$) the effect of consumption amenities on welfare is weak. In this case, we know from proposition 3 that tourist welfare is decreasing in the number of tourists visiting the city. As a result, ΔV_T is decreasing in ϕ_T, and condition (16) is verified. The closed-form expression for ϕ_T at the interior equilibrium is:

$$\phi_T = \frac{TP_1}{TP_1 + TP_2} + \frac{TP_1 a_{k,2} n_{R,2} - TP_2 a_{k,1} n_{R,1}}{(TP_1 + TP_2) N_T I_T}, \tag{19}$$

where the two terms, labeled TP_1 and TP_2, can be interpreted as the *tourist potential* of a city in terms of historical amenities, tradable and non-tradable sectors productivity, and total land:

$$TP_1 \equiv \left(\frac{A_1 a_{s,1}^{\gamma} H_1^{1-\gamma+\beta_s\gamma}}{a_{k,1}^{\alpha_s\gamma}} \right)^{1/\delta},$$

$$TP_2 \equiv \left(\frac{A_2 a_{s,2}^{\gamma} H_2^{1-\gamma+\beta_s\gamma}}{a_{k,2}^{\alpha_s\gamma}} \right)^{1/\delta},$$

where $\delta \equiv (1 - \gamma + \beta_s\gamma) - \frac{\gamma(1-\varepsilon)}{\varepsilon} > 0$ since consumption amenities are weak. The tourist potential of a city is positively related to the level of the historical amenity, the productivity of the non-tradable sector, the land stock, and it is inversely related to the productivity of the tradable sector.

situation, the spatial equilibrium encompasses the full agglomeration of tourists in one destination, even when the two cities are identical in terms of the exogenous parameters.

The effect of A is obvious, since it is a parameter that enters directly into the utility function of tourists. The effect of H works through a reduction in the price of land, see equation (13), and in the price of non-tradable services, see equation (14). The parameter a_s makes a city more attractive through a reduction in p_s again. A rise in a_k (and in the city's wage rate) makes it less attractive through a corresponding rise in q and p_s.

We still have to rule out corner solutions. Intuitively, an interior equilibrium exists as long as none of the two cities is overwhelmingly more attractive than the other, from the tourist's point of view. Merging (17) and (18), we obtain the following restriction on the ratio of the tourist potential of the two cities:

$$\frac{a_{k,1}n_{R,1}}{a_{k,2}n_{R,2}+N_T I_T} < \frac{TP_1}{TP_2} < \frac{a_{k,1}n_{R,1}+N_T I_T}{a_{k,2}n_{R,2}}. \tag{20}$$

When these inequalities do not hold, tourists concentrate in a single city (either $\phi_T = 0$ or $\phi_T = 1$ in equilibrium). We label this situation a *tourist hub.* These two possible cases - interior equilibrium and tourist hub - are depicted in figure 3. Condition (20) also shows that, in general, when the total number of tourists N_T is high, a tourist hub never emerges under weak consumption amenities.

[Insert Figure 3 about here]

We now discuss the implications of the two-city structure for residents welfare, with a special emphasis on the role of historical amenities, A. When residents are immobile, we can go back to equations (11) – (14) and obtain the endogenous variables of the model in terms of the tourism potential in both cities. Let us focus on city 1. We find that the the share of the labour force employed in the non-tradable sector, $L_{s,1}/n_{R,1}$, the number of firms in the non-tradable sector, m_1, the price of land, q_1, and the price of non-tradable goods, $p_{s,1}$, are positively related the level of historical amenities A_1. Cities with more historical amenities have, on one hand, higher consumption amenities and higher land income; on the other hand, they have higher prices for the two consumption goods, namely non-tradable services and land itself. Given proposition 2, historical amenities raise the welfare of residents unambiguously: even though they do not have a direct impact on residents welfare, they attract more tourists to the city and affect the endogenous variables of the model.

Proposition 4. *The welfare of residents in city 1, $V_{R,1}$, is always increasing in the level of local historical amenities, A_1.*

The important implication of this result is that, *ceteris paribus*, for residents it is better to live in a city with higher historical amenities than in a city with lower historical amenities, thanks to the economic consequences of tourism on the urban economy. The higher is the historical amenity advantage of, say, city 1 over city 2, the higher is the share of tourists ϕ_T, and, therefore, the higher is the welfare of residents in city 1 as compared to city 2.

4.2 Spatial equilibrium with mobile residents

We now allow the resident population to relocate between the two cities to take advantage on any welfare differentials that may arise, including those induced by tourism. Thus, the spatial distribution of residents in the urban system is now determined in the spatial equilibrium together with the distribution of tourists. We still assume that consumption amenities are weak ($\varepsilon > \hat{\varepsilon}$) and treat the total number of tourists in the urban system, N_T, as exogenous. Let ϕ_R denote the share of residents who live in city 1, $\phi_R = n_{r,1}/N_R$. To characterize the spatial equilibrium, we take into account two facts. First, the welfare of tourists in both cities now depends on ϕ_R, besides ϕ_T; thus, we rewrite (15) as:

$$
\begin{aligned}
& \Delta V(\phi_T, \phi_R) \equiv V_{T,1}(\phi_T, \phi_R) - V_{T,2}(\phi_T, \phi_R) = 0 \quad \text{and} \quad 0 < \phi_T < 1, \qquad (21)\\
\text{or} \quad & \Delta V_T(\phi_T, \phi_R) \leq 0 \quad \text{and} \quad \phi_T = 0,\\
\text{or} \quad & \Delta V_T(\phi_T, \phi_R) \geq 0 \quad \text{and} \quad \phi_T = 1,
\end{aligned}
$$

where the first condition describes an interior solution and the second and third conditions describe the corner solutions where tourists cluster in one city. Second, we need a condition to describe the spatial equilibrium for residents. Under weak consumption amenities ($\varepsilon > \hat{\varepsilon}$ and $\delta < 0$) we can rule out the existence of corner solutions for residents (either $\phi_R = 0$ or $\phi_R = 1$) for any value of ϕ_T, because their indirect utility becomes very large when the number of residents approaches zero. Thus, at the spatial equilibrium the welfare of residents must be equal in the two cities:

$$
\Delta V(\phi_T, \phi_R) \equiv V_{R,1}(\phi_T, \phi_R) - V_{R,2}(\phi_T, \phi_R) = 0, \quad \text{and} \quad 0 < \phi_R < 1. \qquad (22)
$$

The system of equations (21) and (22) is non-linear and cannot be fully solved in closed form. To further illustrate the properties of the model, we run a simple simulation exercise. Specifically, we study what happens when the relative value of historical amenities in the two cities changes. We consider two symmetrical cities in terms of land endowments, and tradable and non-tradable sectors TFP, and we compute the equilibrium distribution of tourists and residents in the two cities for different values of relative tourist amenities. We fix the parameter A_2 to the value of 1 in city 2, and let the corresponding parameter in city 1, A_1, vary from 0.9 to 1.1. We base our simulation on the average values for roughly 800 cities in the top 9th decile of the tourist/resident ratio in 2001 in our Italian data. On average, these municipalities host 9,550 residents and 260 tourists;[14] multiplying by 2 to mimic a two-city system, we obtain $N_R = 19,100$ and $N_T = 520$. The average land area is 46 squared kilometres, thus we set $H = 46$ in both cities. We set a_k, the TFP in the intermediate sector, equal to $16,115$ to match the median value of disposable income in Italy for a single person, and we assume the same value for the TFP in the services sector, a_s. For the parameters α_s, β_s, and ε we use the values reported in section 3.3; in addition, we set $1-\gamma$, the share of land expenditure in consumer's budget, equal to 0.3. Finally, we use equation (12) and the total number of food-services establishments and retail stores in our tourist-intensive municipalities to calibrate a value for the fixed cost in the services sector, η; since $m = 140$ in our sample, a back-of-the-envelope calculation gives $\eta = 229,770$.

Figure 4a shows that in the value range $0.9 < A_1 < 1.1$, the share of city 1's labor force employed in the services sector increases by roughly 5 percentage points, remaining well below the full specialization cutoff. In figure 4b we illustrate our main simulation results. A 4% difference in the relative value of amenities is enough to attract all tourists in one of the two cities: when $A_1 < 0.96$, roughly, all tourists go to city 2, whereas when $A_1 > 1.04$ all tourists go to city 1. Within this range, we get an interior equilibrium where tourists visit both cities. The share of tourists in city 1 goes up as A_1 increases. Furthermore, the increasing tourist population raises the welfare of residents in city 1, and therefore entices more residents to relocate there from city 2 until indirect utilities are again equalized in the two cities. From roughly 0.475, when there are no tourists around, the share of the total resident population who lives in city 1 goes up to roughly 0.525, when all tourists visit that city. Moreover, the figure shows that the share of tourists increases more rapidly than the share of residents as historical amenities in city 1 rise. In other terms, as a tourist destination becomes more attractive, the spatial sorting of tourists is more intense than the sorting of residents. This is to be expected, since historical amenities affect tourists' utility in a direct fashion, while residents are affected only indirectly through the mechanisms at work in our model (i.e., real land income and endogenous consumption amenities).

[14] As in the empirical analysis, the tourist population equals the number of overnight stays divided by 365.

[Insert Figure 4 about here]

It is interesting to note how the spatial sorting of residents and tourists in the two cities is in fact driven by a sort of comparative advantage. Let us add some analytical derivations. When we are at an interior spatial equilibrium ($0 < \phi_T < 1$) using (21) and (22) we get that

$$\frac{1}{A_2}\frac{1-\phi_T}{1-\phi_R} - \frac{1}{A_1}\frac{\phi_T}{\phi_R} = \frac{1}{1-\gamma+\beta_s\gamma\varepsilon}\left(\frac{a_{k,1}}{A_1} - \frac{a_{k,2}}{A_2}\right)\frac{N_R}{N_T I_T},$$

where the constant term on the right-hand side of this expression can be interpreted as a measure of the comparative advantage of city 1 at attracting residents through high wages ($w = a_k$ under partial specialization) over attracting tourists through high historical attractions. Accordingly, when city 1 has a comparative advantage at attracting residents and city 2 at attracting tourists,

$$\frac{a_{k,1}}{A_1} > \frac{a_{k,2}}{A_2}, \tag{23}$$

we get

$$\frac{\phi_T}{\phi_R} < \frac{A_1}{A_2}\frac{1-\phi_T}{1-\phi_R}, \tag{24}$$

which says that the share of tourists over the share of residents in city 1 is smaller than the share of tourists over the share of residents in city 2, net of relative historical amenities. Going back to our simulation exercise, tradable sector's TFP and wages are equal in the two cities ($a_{k,1} = a_{k,2}$) and $A_2 = 1$. When $A_1 < 1$ in the simulations, (23) is still verified so that city 1 has a comparative advantage at attracting residents, and city 2 at attracting tourists. From (24) we easily derive that the share of tourists hosted in city 1 is smaller than the share of residents, $\phi_T < \phi_R$. Along the same line of reasoning, for $A_1 = 1$ we get that $\phi_T = \phi_R$, while for $A_1 > 1$ city 1 has a comparative advantage at attracting tourists over residents, and then $\phi_T > \phi_R$. These patterns are exactly matched by figure 4b.

The role of historical amenities in attracting residents to the city is amplified by the strength of endogenous consumption amenities: stronger product differentiation in services strengthens the pull of residents exerted by the expanding services sector. To show this, we re-run the previous exercise for 10 different values of ε, ranging from 0.65 to 0.95. A lower value of this parameter corresponds to stronger consumption amenities. Figure 5 shows the increase in the share of residents living in city 1, ϕ_R, corresponding to the increase in historical amenities from 0.9 to 1.1, such that the whole tourist population moves from city 2 to city 1, for different values of ε. The impact of increasing historical amenities ranges from below 1%, when consumption amenities are very weak ($\varepsilon = 0.95$) to more than 20%, when consumptions amenities are moderate ($\varepsilon = 0.65$). With a vertical line we indicate the benchmark value for ε that was set at $\varepsilon = 0.75$.

[Insert Figure 5 about here]

We now investigate the relationship between historical amenities, tourism and the welfare of residents. Varying the relative value of amenities, we study the indirect utility of a resident in the urban system (since residents are free to move, their welfare in the two cities is equalized in the urban system). Our results are reported in figure 6. On the y-axis we show the indirect utility of any resident in the urban system, V_R, for different values of ε. Since we are interested, for a given ε, in studying the welfare of residents associated to a specific spatial distribution of tourists, for each value of ε we have normalized welfare to one in the baseline scenario where no tourist goes to city 1 ($A_1 = 0.9$).[15] Two points stand out in figure 6. First, the welfare of residents is not monotone in the relative value of historical amenities and, thus, in the number of tourists who visit the city. This contrasts with the scenario where residents are immobile. Second, the shape of the welfare schedule depends crucially on the strength of consumption amenities. When consumption amenities are not too weak (low ε) welfare reaches a maximum at $A_1/A_2 = 1$, when tourists are equally spread between the two cities. In our baseline parametrization, with $\varepsilon = 0.75$, the welfare gain associated to having two equally attractive cities with equal historical amenities is tiny, roughly 0.02%, as compared to a scenario where tourist attractions are concentrated in a single destination (where all tourists cluster). In contrast, when consumption amenities are very weak (high ε) the reversed pattern obtains; in this case, residents are best off when A_1/A_2 is either very low or very high, and all tourists agglomerate in one city. In the former case (low ε) when both cities are similar and receive tourists they develop a thriving services sectors, which is valuable to consumers given that product varieties are well differentiated. In the latter case (high ε) where product varieties are poorly differentiated, the best option from the residents' point of view is to live in an asymmetric urban system, where one city is relatively specialized in retail services, hosts a larger resident population, and has a rich pool of historical amenities which attract all tourists, and the other city remains a smaller manufacturing town, relatively specialized in the production of tradable goods, and with little or zero historical amenities to amuse tourists.

[15] Without normalization, V_R is strictly higher for a lower ε, for any value of A_1.

[Insert Figure 6 about here]

In appendix A.6 we show that the basic mechanisms are the same when we allow the tradable sector productivity, in addition to historical amenities, to differ across cities.

5 Extensions

5.1 Congestion effects

In our model with a fixed resident population, tourism improves the welfare of residents at the city level, even as the number of tourists becomes very large. However, excessive tourism may cause a number of problems such as increased commuting times, noise, congestion on public transports, etc.[16] These issues represent a form of non-market congestion. To introduce them we develop a simple extension of our framework. Let us bring back into the model the parameter A_R, indexing local amenities for residents, such that the utility of residents is:

$$U_i = A_R \left(\frac{C_R}{\gamma} \right)^{\gamma} \left(\frac{h_R}{1-\gamma} \right)^{1-\gamma}, \qquad 0 < \gamma < 1.$$

We assume that the amenity A_R is subject to non-market congestion; that is, it depreciates as the number of tourists in the city n_T increases, $\frac{\partial A_R}{\partial n_T} < 0$. Since A_R doesn't enter the maximization problem, the equilibrium allocation is the same as before. Thus, we can write the indirect utility of residents as $\tilde{V}_R \equiv A_R V_R$, where V_R is the equilibrium welfare of residents in the baseline case – see section 3.

As an illustration, suppose that $A_R(n_T) = e^{-\rho n_T}$. Then,

$$\frac{\partial \tilde{V}_R}{\partial n_T} < 0 \iff -\frac{\partial A_R}{\partial n_T}\frac{n_T}{A_R} > \frac{\partial V_R}{\partial n_T}\frac{n_T}{V_R}$$

where we are comparing two elasticities with respect to the number of tourists: the elasticity of non-market congestion, and the elasticity of V_R (which combines the elasticity of consumption amenities and real land income). We then get the condition

$$\rho > \frac{\partial V_R}{\partial n_T}\frac{1}{V_R}. \tag{25}$$

The optimal number of tourists, n_T^*, that maximizes residents welfare is the one implicitly defined by the following condition:

$$\rho = \frac{\partial V_R}{\partial n_T}\frac{1}{V_R}.$$

[16] For a review see Garcia-Hernandez *et al.* (2017) or McKinsey (2017).

If we assume that ρ is not too large, $\rho < \frac{\partial V_R}{\partial n_T}\frac{1}{V_R}$ for n_T close to zero. In this case a sufficient condition for the existence of an optimal level of tourists that maximizes resident welfare $\tilde{V}_R$ is that the right-hand side of (25) is monotonically decreasing in n_T. In Appendix A.5 we provide it, and show that, basically, it entails that consumption amenities are not too weak. For low levels of tourism ($n_T < n_T^*$) the combination of increasing real incomes and increasing consumption amenities prevail over non-market congestion forces; for high levels of tourism ($n_T > n_T^*$), the opposite is true. Consequently, with congestion effects the welfare of residents is hump-shaped in the number of tourists, with a bliss point at n_T^*.

5.2 High substitutability between labor and intermediate inputs

In this section, we develop a simple extension of the production function in the services sector, such that the elasticity of substitution between labor and the intermediate input can be greater than one. Under partial specialization, this mechanism implies that it takes a larger number of tourists for cities to reach full specialization. This result reinforces our conclusion that the partial specialization scenario is the most relevant to analyze: beforehand we made this point on empirical grounds, given that full specialization is hard to observe in real world – we now add a theoretical argument.

In practice, we assume that labor and the intermediate input are combined according to a CES structure, with elasticity of substitution $\theta \geq 1$; this structure is then nested into a Cobb-Douglas production function that includes land. Therefore, all the results that follow subsume our baseline results as a special case in which $\theta = 1$. Formally, let the production function for the non-tradable good be:

$$y_s = a_s h_s^{\beta_s} \left[(\alpha_s)^{\frac{1}{\theta}} l_s^{\frac{\theta-1}{\theta}} + (1-\alpha_s-\beta_s)^{\frac{1}{\theta}} y_k^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}(1-\beta_s)}, \quad \theta \geq 1,$$

while the production function for the intermediate good is the same as in the baseline case. Combining the first-order conditions for l_s and y_k, and summing over all firms we obtain:

$$wL_s = \frac{\alpha_s}{(1-\alpha_s-\beta_s)} w^{1-\theta} Y_k.$$

Using the market clearing condition for the intermediate good and for labor, and following the same steps as in section 3.3, we can write:

$$wL_s = \frac{\alpha_s w^{1-\theta}}{\alpha_s w^{1-\theta} + (1-\alpha_s-\beta_s)} (wn_R + n_T I_T - m\eta).$$

Using the zero profit condition we get

$$\frac{L_s}{n_R} = f(\theta)\left(1 + \frac{n_T I_T}{w n_R}\right), \tag{26}$$

where $f(\theta) = \frac{\varepsilon(1-\beta_s)}{1-\beta_s\varepsilon}\frac{\alpha_s w^{1-\theta}}{\alpha_s w^{1-\theta}+(1-\alpha_s-\beta_s)}$. Equation (26) is a generalization of equation (11). The wage is pinned down in the intermediate sector ($w = a_k$) under partial specialization, and the share of residents employed in services still increases linearly with the number of tourists. However, given that $f(1) = \alpha_s\varepsilon/(1-\beta_s\varepsilon)$ and $f'(\theta) < 0$ for $\theta \geq 1$, the slope of $\frac{L_s}{n_R}$ with respect to n_T is now flatter than in (11). As a result, the threshold $\hat{n}_T$ is also larger than in the baseline case. In particular, it is possible to show that $\hat{n}_T$ is increasing in θ, and tends to infinity as $\theta \to \infty$. Thus, the scope of partial specialization increases the more substitutable are labor and the intermediate input.

6 Conclusions

In this paper we have shown that the number of establishments and employment in non-tradable services industries that are related to consumption amenities react to the inflow of tourists at the city level in Italy. Consistently with these findings, we set up a general equilibrium model of small open cities that are a tourist destination, to study the impact of tourism on endogenous amenities, factors' allocations across sectors, prices, and welfare.

The model brings new normative implications about tourism and residents' welfare. An interesting message of our paper concerns whether it is better for a resident to live in a city with more historical amenities and hence more tourism than other cities. We show why and when this is the case, and we also show that when residents are mobile the strength of consumption amenities can make an urban system where cities are similar in terms of historical amenities the best possible configuration. In other terms, our model sheds light on the welfare consequences of the interaction of historical (exogenous) amenities and consumption (endogenous) amenities at the urban level. Our model also contributes to the literature about the economic consequences of tourism, which is a fast-growing sector all over the world. An interesting direction for future research would be to widen the empirical analysis, by examining the reaction of prices to tourism, and by thoroughly investigating the causal link between tourism and the endogenous variables of our model.

References

Anas A., Pines D. (2008) Anti-sprawl policies in a system of congested cities, *Regional Science and Urban Economics*, 38: 408-423.

Banca d'Italia (2017) Indagine sul turismo internazionale, Roma.

Carlino G.A., Saiz, A. (2008) City Beautiful, *IZA Discussion Paper* No. 3778.

Chao C., Hazari B.R., Laffargue J.,Sgro P.M., Eden S.H. (2006) Tourism, Dutch-disease and welfare in an open dynamic economy, *Japanese Economic Review*, 57: 501-515.

Copeland B. (1991) Tourism, Welfare and De-industrialization in a Small Open Economy, *Economica*, 58: 515-529.

Garcia-Hernandez M. , de la Calle-Vaquero M., Yubero C. (2017) Cultural heritage and urban tourism: historical cities under pressure, *Sustainability*, 9(8): 1346.

Glaeser E.L., Kolko J., Saiz A. (2001) Consumer city, *Journal of Economic Geography*, 1: 27-50.

Istat (2017a) Condizioni di vita, reddito e carico fiscale delle famiglie, Roma.

Istat (2017b) Movimento turistico in Italia, Roma.

Lee S. (2010) Ability sorting and consumer city, *Journal of Urban Economics*, 68: 20-33.

Mazzolari F., Neumark D. (2012) Immigration and product diversity, *Journal of Population Economics*, 25(3): 1107-1137.

McKinsey& Company and World Travel & Tourism Council (2017) Coping with success: managing overcrowding in tourism destinations.

Roback J. (1982) Wages, rents and the quality of life, *Journal of Political Economy*, 90: 1257-1278.

Rosen S. (1979) Wage-based indexes of urban quality of life. In *Current issues in urban economics*, Johns Hopkins University Press.

Schiff N. (2015) Cities and product variety: evidence from restaurants, *Journal of Economic Geography*, 15(6): 1085-1123.

Valentinyi A., Herrendorf B. (2008) Measuring Factor Income Shares at the Sector Level, *Review of Economic Dynamics*, 11: 820-835.

Waldfogel J. (2008) The median voter and the median consumer: Local private goods and population composition, *Journal of Urban Economics*, 63(2): 567-582.

A Appendix

A.1 Description of the main variables used in the empirical analysis

Tourism. Our data provide the total number of overnight stays in tourist accommodation establishments at the province level and the total number of beds in tourist accommodation establishments at the municipality level - a measure of capacity. We compute the share of beds in each municipality over its province total; then, we allocate overnight stays to each municipality based on this capacity weight. Finally, we divide the number of overnight stays by 365: in this way, we construct a "resident-equivalent" measure of the number of tourists. Source: *Annual Survey of Capacity of Tourist Accommodation Establishments* (Istat), years 2001 and 2011.

Resident population. The resident population is taken from Census, and it is expressed in thousands of units. Source: *Population Census* (Istat), years 2001 and 2011.

Establishments. Hotels per 1000 residents is the total number of local units in the tourist accommodation sector (therefore, it includes hostels, campings, etc.) divided by the resident population expressed in thousands. Restaurants and bars per 1000 residents is the total number of local units in the restaurants and food services sector (therefore, it includes hostels, campings, etc.) divided by the resident population expressed in thousands. Retail shops per 1000 residents is the total number of local units in the retail shop sector (therefore, it includes hostels, campings, etc.) divided by the resident population expressed in thousands. Source: *Industry and Services Census* (Istat), years 2001 and 2011.

Labor force. The share of labor force in the retail services sector is the sum of the number of workers employed in the tourist accommodation sector, in the restaurant and food services sector, and in the retail shop sector, divided by the total number of workers employed in the municipality. Source: *Industry and Services Census* (Istat), years 2001 and 2011.

A.2 Exact values of the constants

These are the exact values of some of the constants that appear in the paper:

$$\kappa_s = \alpha_s^{\alpha_s}\beta_s^{\beta_s}(1-\alpha_s-\beta_s)^{(1-\alpha_s-\beta_s)},$$

$$\kappa_m = \frac{1-\varepsilon}{1-\beta_s\varepsilon},$$

$$\kappa_q = \frac{1-\gamma+\beta_s\varepsilon\gamma}{\gamma(1-\beta_s\varepsilon)},$$

$$\kappa_p = \frac{\kappa_q^{\beta_s}}{\varepsilon\kappa_s}.$$

A.3 Analytical derivations for the baseline model

A.3.1 Optimal price p_s

Rewrite the first order conditions in the non-tradable sector (5) as:

$$\begin{aligned} l_{sj} &= \tfrac{\alpha_s}{1-\alpha_s-\beta_s}\tfrac{y_k}{w}, \\ h_{sj} &= \tfrac{\beta_s}{1-\alpha_s-\beta_s}\tfrac{y_k}{q}, \\ p_{sj} &= \tfrac{1}{\varepsilon(1-\alpha_s-\beta_s)}\tfrac{y_{kj}^{\alpha+\beta}}{a_s l_s^{\alpha_s} h_s^{\beta_s}}, \end{aligned} \tag{27}$$

where we have divided the first and the second condition by the third, and rearranged the third in terms of p_{sj}. Now plug the first and the second equation into the third of (27) to obtain $p_s = \frac{w^{\alpha_s}q^{\beta_s}}{\varepsilon\kappa_s a_s}$.

A.3.2 Current account balance equation

As a preliminary step, not that total consumer expenditure can be expressed as $n_R I_R$, because all residents earn the same income (the wage is equalized in the two sectors) and the labor market clears - equation (9). With this in mind, plug the first order conditions for consumers (1) into the market clearing conditions for the non-tradable (7) goods and land (8).

$$\begin{aligned} \gamma w n_R + \gamma q H + \gamma n_T I_T &= m p_s y_s \\ (1-\gamma) w n_R + (1-\gamma) q H + (1-\gamma) n_T I_T + q m h_S &= qH \end{aligned}$$

Then, use the zero profit condition in the first equation ($p_s y_s = w l_s + q h_s + y_k + \eta$), and sum the two equations to get:

$$w n_R + qH + n_T I_T + q m h_S = w m l_s + q m h_s + m y_k + m\eta + qH,$$

where we expressed the firm variables on the right-hand side in aggregate terms. Note that the qH_s and the qH terms cancel out. Now, plug into this expression the market clearing condition for the intermediate input (10):

$$wn_R + n_T I_T = wml_s + Y_k^o + X.$$

Finally, plug in the zero profit condition in the $Y_k^o = wL_k$ and note that $w(ml_s + L_K)$ cancels out with wn_R on the left-hand side by labor market clearing. We are left with:

$$n_T I_T = X.$$

A.3.3 Share of the labor force employed in the services sector

Optimal firm behavior in both sectors allows us to write:

$$\begin{aligned}
wL_s &= \alpha_s \varepsilon p_s Y_s \\
&= \frac{\alpha_s}{1-\alpha_s-\beta_s} Y_k \\
&= \frac{\alpha_s}{1-\alpha_s-\beta_s} (Y_k^o + X - m\eta) \\
&= \frac{\alpha_s}{1-\alpha_s-\beta_s} (wL_k + n_T I_T - m\eta),
\end{aligned}$$

where we have also used the market clearing condition (10) in the third equality, and the current account balance condition in the fourth equality. Second, using the labor market clearing condition (9), we obtain:

$$wL_s = \frac{\alpha_s}{1-\beta_s}(wn_R + n_T I_T - m\eta).$$

which depends on the wage rate and on the number of firms. Finally, we can write the zero profit condition in sector s (6) in terms of wL_s as

$$\pi_s = 0 \iff \frac{1-\varepsilon}{\varepsilon}\frac{wL_s}{\alpha_s} = m\eta, \tag{28}$$

and substitute it back into the previous expression to obtain

$$\frac{L_s}{n_R} = \frac{\alpha_s \varepsilon}{1-\beta_s \varepsilon}\left(1 + \frac{n_T I_T}{wn_R}\right).$$

A.3.4 Equilibrium number of firms, m and land price, q

The zero profit condition (6), given constant factor shares and constant mark-up, can be written as

$$\frac{1-\varepsilon}{\varepsilon}\frac{w_s L_s}{\alpha_s} = m\eta$$

Substituting equation (11) in the main text with $w = a_k$, we obtain the number of firms in the non-tradable sector as given by expression (12).

Let us turn to the land price q. First, total consumer expenditure on land is

$$(1-\gamma)[wn_R + qH + n_T I_T].$$

Second, total firm expenditure on land is: $qH_s = \frac{\beta_s}{\alpha_s} wL_s = \frac{\beta_s \varepsilon}{1-\beta_s\varepsilon}(wn_R + n_T I_T)$. Equating the sum of these expressions to total land revenue qH, for the case where $w = a_k$, and isolating q, we obtain expression (13) for the land price.

A.4 Proofs of propositions

A.4.1 Proof of proposition 2

Substitute the wage rate $w = a_k$, the land price (13), and the price of non-tradable services (14) into the expression for V_R given by equation (3). We obtain:

$$V_R = \frac{K}{n_R} \frac{(1+\kappa_q)a_k n_R + \kappa_q n_T I_T}{(a_k n_R + n_T I_T)^{1-\gamma+\beta_s\gamma} - \frac{\gamma(1-\varepsilon)}{\varepsilon}}$$

where $K \equiv (\frac{\kappa_m}{\eta})^{\frac{\gamma(1-\varepsilon)}{\varepsilon}} \frac{(\varepsilon\kappa_s)^\gamma}{(\kappa_q)^{1-\gamma+\beta_s\gamma}} \frac{a_s^\gamma H^{1-\gamma+\beta_s\gamma}}{a_k^{\alpha_s\gamma}}$. The numerator of V_R derives from the nominal income of residents as a function of tourists, whereas the denominator combines the land price component, $(1-\gamma+\beta_s\gamma)$, and the love of variety component, $\frac{\gamma(1-\varepsilon)}{\varepsilon}$. Note that land price has a direct effect on the aggregate price index $(1-\gamma)$ and an indirect effect, since it is part of the marginal cost for firms in the services sector $(\beta_s\gamma)$. Take the derivative with respect to n_T:

$$\frac{\partial V_R}{\partial n_T} = \frac{K I_T}{n_R(a_k n_R + n_T I_T)^{2-\gamma+\beta_s\gamma-\frac{\gamma(1-\varepsilon)}{\varepsilon}}} \times$$
$$\left\{\kappa_q(a_k n_R + n_T I_T) - \left[1-\gamma+\beta_s\gamma - \frac{\gamma(1-\varepsilon)}{\varepsilon}\right][(1+\kappa_q)a_k n_R + \kappa_q n_T I_T]\right\}.$$

Collect terms:

$$\frac{\partial V_R}{\partial n_T} = \frac{K I_T}{n_R(a_k n_R + n_T I_T)^{2-\gamma+\beta_s\gamma-\frac{\gamma(1-\varepsilon)}{\varepsilon}}} \times$$
$$\left\{\left(\gamma(1-\beta_s) + \frac{\gamma(1-\varepsilon)}{\varepsilon}\right)\kappa_q n_T I_T + \left[\kappa_q - \left(1-\gamma+\beta_s\gamma - \frac{\gamma(1-\varepsilon)}{\varepsilon}\right)(1+\kappa_q)\right] a_k n_R\right\}.$$

Now plug in the expression for κ_q and do the remaining simplifications:

$$\frac{\partial V_R}{\partial n_T} = \frac{K I_T}{n_R(a_k n_R + n_T I_T)^{2-\gamma+\beta_s\gamma} - \frac{\gamma(1-\varepsilon)}{\varepsilon}} \left\{\frac{1-\gamma+\beta_s\gamma\varepsilon}{\varepsilon} n_T I_T + \frac{(1-\varepsilon)}{\varepsilon} a_k n_R\right\},$$

which is always positive.

A.4.2 Proof of proposition 3

Substitute the equilibrium expressions for the number of firms (12), the land price (13), and the price of non-tradables (14) into the indirect utility of tourists (4). For $n_T < \hat{n}_T$, we get:

$$V_T = \frac{KA_T I_T}{(a_k n_R + n_T I_T)^{1-\gamma+\beta_s\gamma-\frac{\gamma(1-\varepsilon)}{\varepsilon}}},$$

where K is a constant term, as defined above. The partial derivative with respect to the number of tourists can be written as:

$$\frac{\partial V_T}{\partial n_T} = \left[\frac{\gamma(1-\varepsilon)}{\varepsilon} - (1-\gamma+\beta_s\gamma)\right]\frac{V_T}{a_k n_R + n_T I_T}.$$

This expression is less than zero for $\varepsilon > \frac{\gamma}{1+\beta_s\gamma}$.

A.5 Sign of the derivative of $\frac{\partial V_R}{\partial n_T}\frac{1}{V_R}$ with respect to n_T

In this section we provide a sufficient condition for the function

$$\frac{\partial V_R}{\partial n_T}\frac{1}{V_R} \tag{29}$$

to be monotonically decreasing in n_T. The sign of the derivative of (29) with respect to n_T is equal to the sign of the following binary quadratic form:

$$[\varepsilon(2-\gamma+\beta_s\gamma\varepsilon)-1](a_k n_R)^2 - 2(1-\gamma+\beta_s\gamma\varepsilon)(1-\varepsilon)a_k n_R n_T I_T - (1-\gamma+\beta_s\gamma\varepsilon)^2(n_T I_T)^2,$$

which is quadratic with respect to the two terms $a_k n_R$ and $n_T I_T$. A sufficient condition for the quadratic form to be negative is that

$$\varepsilon(2-\gamma+\beta_s\gamma\varepsilon) < 1$$

which can be written as

$$\varepsilon - \gamma + \beta_s\gamma\varepsilon < \frac{(1-\varepsilon)^2}{\varepsilon}. \tag{30}$$

When consumption amenities are strong ($\varepsilon \leq \hat{\varepsilon}$) the sufficient condition (30) is satisfied, and then (29) is decreasing in n_T. When consumption amenities are weak, the left-hand side of (30) is positive: this condition is still satisfied if ε is not too large (consumption amenities are not too weak). We call the value of ε such that $\varepsilon - \gamma + \beta_s\gamma\varepsilon = \frac{(1-\varepsilon)^2}{\varepsilon}$ as $\hat{\hat{\varepsilon}}$. Then, (29) is decreasing in n_T also for the case $\hat{\varepsilon} < \varepsilon \leq \hat{\hat{\varepsilon}}$. We give a graphical representation of this condition in the figure that follows.

[Insert Figure 7 about here]

A.6 Further simulations for the two cities system with mobile residents

The qualitative results of our simulations are confirmed when we introduce more asymmetry between cities. As a further step, we repeat our analysis setting $a_{k,1} = 16,920$ and $a_{k,2} = 15,310$, respectively 5% above and below the median value of median disposable income in Italy in 2015 (Istat, 2017a). Thus, we let city 1 be more productive than city 2 at the production of the tradable intermediate inputs, which translates into higher wages for residents.

We report the spatial distribution of tourists in figure 8a, and the welfare schedule in figure 8b.

[Insert Figure 8 about here]

Since the interior equilibrium now obtains in the range 1.06 to 1.14, on the x-axis we plot A_1/A_2 ranging from 1 to 1.2. As expected, it takes a higher value of A_1 to shift tourists from city 2 to city 1, given the productivity advantage of city 1, which makes it more apt to be a resident-city. The share of residents, ϕ_R, is still positively related to the share of tourists, ϕ_T.

When it comes to welfare, we observe the same reversal as before. For low values of ε, residents are better off when the two cities in the urban system are relatively similar in terms of historical amenities, such that tourists split between them; note, however, that the peak now occurs when $A_1 = 1.09$ and the share of tourists in city 1 is 0.45, that is, lower than one half as in the symmetric case in the main text. For high values of ε residents are better off when the two cities are heterogenous in terms of historical amenities, so that city 2 receives the whole tourists population. Furthermore, when cities have a different productivity in the tradable sector, another noteworthy pattern emerges. When ε is high, such that product varieties are poorly differentiated, residents are better off when tourists concentrate in city 2, and city 1, where the tradable sector is more productive (and wages are higher), remains a resident-city. In other words, welfare is maximized when the historical amenities are relatively low in the more productive city, such that the pattern of comparative advantage in the two cities is as heterogeneous as possibile. In contrast, our results suggest that, under moderate product differentiation (i.e., $\varepsilon = 0.65$) residents are better off when the pattern of comparative advantage is similar in the two cities.

Table 1: Descriptive statistics

	Obs	Mean	S.D.	Min	1st quartile	Median	3rd quartile	Max
Residents (1000)	7873	7.19	39.88	0.03	1.07	2.40	5.79	2546.80
Tourists per 1000 residents	7873	18.93	61.03	0.00	0.00	1.45	8.43	1471.81
Hotels, etc. per 1000 residents	7873	1.23	3.73	0.00	0.00	0.15	0.80	74.26
Restaurants and bars per 1000 residents	7873	4.45	3.65	0.00	2.61	3.57	5.09	79.21
Retail stores per 1000 residents	7873	9.87	5.12	0.00	6.63	9.27	12.28	97.97
Employment in hotels, etc. per 1000 residents	7873	3.79	10.98	0.00	0.00	0.35	2.67	257.09
Employment in restaurants and bars per 1000 residents	7873	10.36	10.17	0.00	4.90	7.87	12.56	196.60
Employment in retail stores per 1000 residents	7873	19.00	18.43	0.00	10.83	15.87	22.44	744.41
Land area (squared km)	7873	37.19	50.21	0.15	11.25	21.77	42.96	1307.71
Δ tourists per 1000 residents	7873	1.74	13.71	-87.77	0.00	0.57	3.15	89.27
Δ hotels per 1000 residents	7873	0.04	2.06	-39.04	-0.03	0.00	0.23	71.43
Δ restaurants and bars per 1000 residents	7873	0.86	2.36	-26.32	-0.03	0.75	1.59	55.18
Δ retail stores per 1000 residents	7873	-1.55	2.72	-29.41	-2.82	-1.54	-0.25	83.22
Δ employment in hotels, etc. per 1000 residents	7873	0.54	12.45	-182.84	-0.40	0.00	0.50	349.88
Δ employment in restaurants and bars per 1000 residents	7873	4.56	10.12	-147.62	0.78	3.63	6.84	223.78
Δ employment in retail stores per 1000 residents	7873	0.28	12.10	-134.42	-3.45	-0.38	2.69	474.48

Notes: The table provides descriptive statistics for the variables used in the regressions. The first set of variables shown are computed with respect to the year 2001. *Residents (1000)* is the number of residents at the city level expressed in thousands. *Tourists per 1000 residents* is the number of tourists normalized by the resident population expressed in thousands. We then report statistics for the total number of establishments and total employment normalized by thousands of residents at the municipality level for some NACE Rev. 2 industries: *Hotels, etc.* is industry 55, *Restaurants and bars* is industry 56, *Retail stores* is the sum of 3-digit industries 471, 472, 475, 476, 477. *Land area* is total urban land area. In the bottom part of the table, we report the change between 2001 and 2011 for the same set of variables.

Table 2: Tourism and number of establishments

	Restaurant and bars	Retail trade						Accommodation
		All	Non-spec. stores	Food, beverages	Household equip.	Books, sport, toys	Clothing, footwear	
NACE Rev. 2	56		471	472	475	476	477	55
Panel A: All municipalities								
Δ tourism	0.018***	0.013***	-0.002	0.003**	0.001	0.003**	0.008***	0.038***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.005)
R^2	0.057	0.051	0.032	0.032	0.035	0.048	0.053	0.216
Obs.	7,873	7,873	7,873	7,873	7,873	7,873	7,873	7,873
Panel B: Without top decile of 2001 tourist density municipalities								
Δ tourism	0.025***	0.017***	-0.004	0.005**	0.001	0.003***	0.012***	0.046***
	(0.006)	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)	(0.003)	(0.006)
R^2	0.049	0.053	0.038	0.035	0.038	0.021	0.048	0.169
Obs.	7,216	7,216	7,216	7,216	7,216	7,216	7,216	7,216
Panel C: Without municipalities with zero tourist density in either 2001 or 2011								
Δ tourism	0.018***	0.012***	-0.001	0.002	0.001	0.003*	0.007***	0.037***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.005)
R^2	0.072	0.077	0.040	0.041	0.049	0.071	0.079	0.226
Obs.	4,951	4,951	4,951	4,951	4,951	4,951	4,951	4,951

Notes: In all columns, the dependent variable is the change in the number of establishments per 1000 residents between 2001 and 2011. Each column represents a different industry. In panel A we use the full sample of municipalities; in panel B we exclude the municipalities in the top decile of the tourists per 1000 residents distribution in 2001; in panel C we exclude municipalities with zero tourist density in either 2001 or 2011. All regressions include as controls total municipal land area, average elevation, a dummy variable for coastal towns, and dummy variables for each province. ***,**,* denote significance at the 1%, 5%, 10% level, respectively. Robust standard errors are reported in parenthesis.

Table 3: Tourism and employment

	Restaurant and bars	Retail trade						Accommodation
		All	Non-spec. stores	Food, beverages	Household equip.	Books, sport, toys	Clothing, footwear	
NACE Rev. 2	56		471	472	475	476	477	55
Panel A: All municipalities								
Δ tourism	0.048***	0.026***	0.000	0.004	-0.001	0.007**	0.016***	0.117***
	(0.016)	(0.009)	(0.006)	(0.003)	(0.003)	(0.003)	(0.005)	(0.029)
R^2	0.088	0.023	0.013	0.033	0.017	0.036	0.017	0.121
Obs.	7,873	7,873	7,873	7,873	7,873	7,873	7,873	7,873
Panel B: Without top decile of 2001 tourist density municipalities								
Δ tourism	0.063***	0.015	-0.011	0.001	-0.004	0.006	0.024**	0.110***
	(0.017)	(0.018)	(0.013)	(0.004)	(0.005)	(0.004)	(0.011)	(0.016)
R^2	0.038	0.022	0.015	0.034	0.018	0.014	0.017	0.064
Obs.	7,216	7,216	7,216	7,216	7,216	7,216	7,216	7,216
Panel C: Without municipalities with zero tourist density in either 2001 or 2011								
Δ tourism	0.041**	0.023***	0.001	0.004	0.001	0.006*	0.011**	0.117***
	(0.018)	(0.009)	(0.005)	(0.004)	(0.002)	(0.003)	(0.004)	(0.032)
R^2	0.112	0.046	0.023	0.044	0.028	0.057	0.033	0.149
Obs.	4,952	4,952	4,952	4,952	4,952	4,952	4,952	4,952

Notes: In all columns, the dependent variable is the change in employment per 1000 residents between 2001 and 2011. Each column represents a different industry. In panel A we use the full sample of municipalities; in panel B we exclude the municipalities in the top decile of the tourists per 1000 residents distribution in 2001; in panel C we exclude municipalities with zero tourist density in either 2001 or 2011. All regressions include as controls total municipal land area, average elevation, a dummy variable for coastal towns, and dummy variables for each province. ***,**,* denote significance at the 1%, 5%, 10% level, respectively. Robust standard errors are reported in parenthesis.

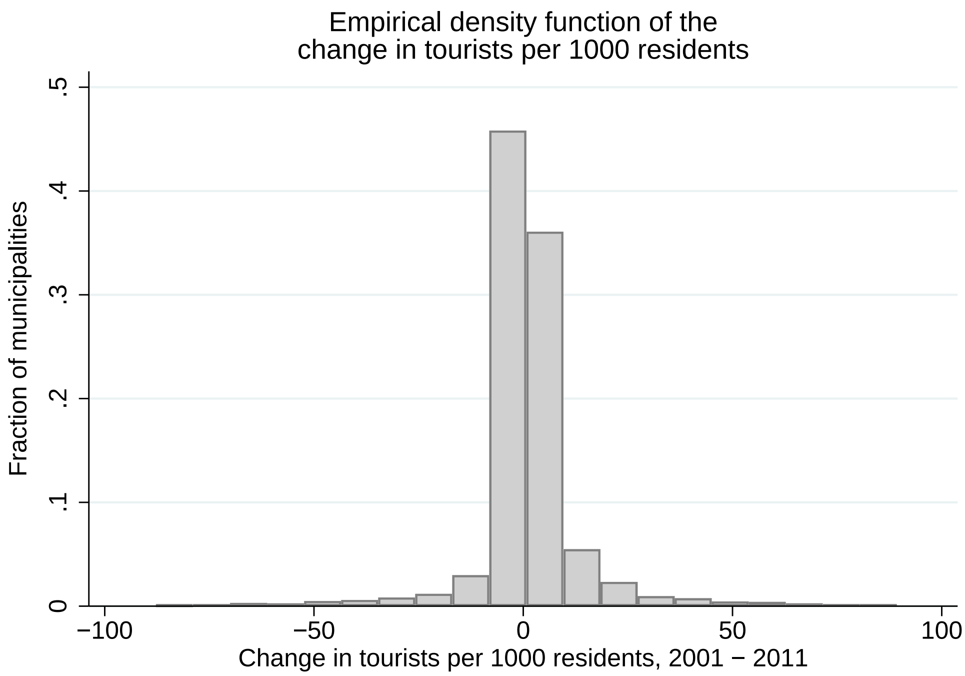


Figure 1: Empirical density function of the change in the number of tourists (in terms of resident-equivalent) per 1000 residents over the period 2001 – 2011, after having dropped municipalities at the top 1% and bottom 1% of the distribution.

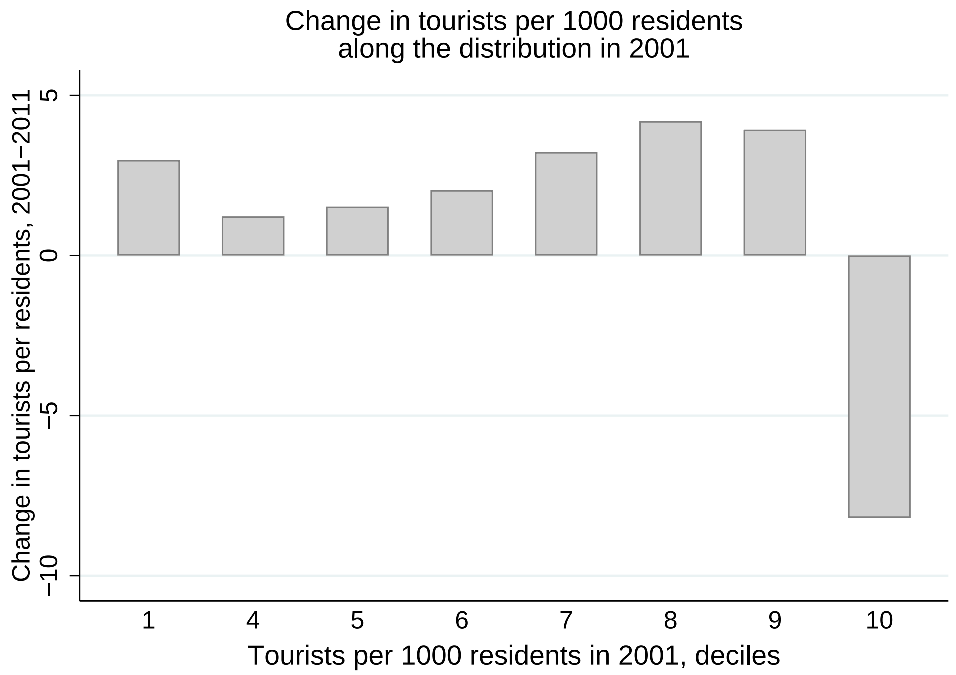
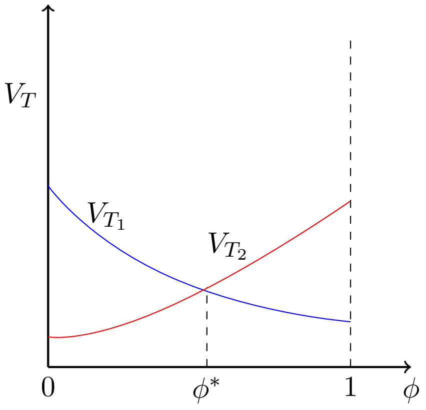
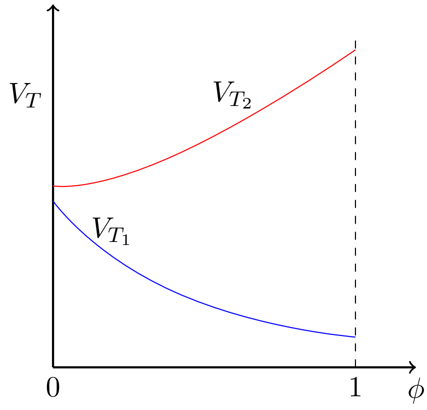


Figure 2: Average change in the number of tourists (in terms of resident-equivalent) per 1000 residents over the period 2001 – 2011. Municipalities are ranked in terms of deciles of the distribution of the number of tourists per residents in 2001.

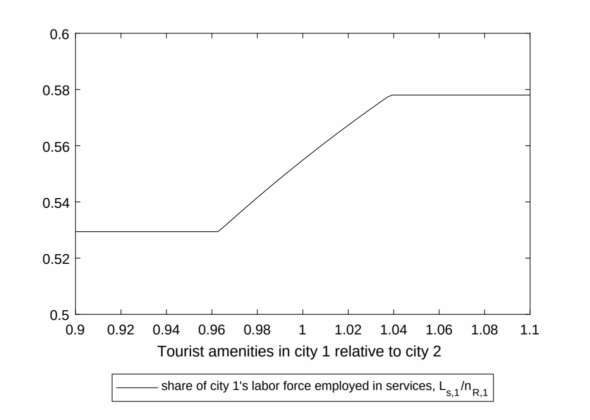


(a) The interior equilibrium

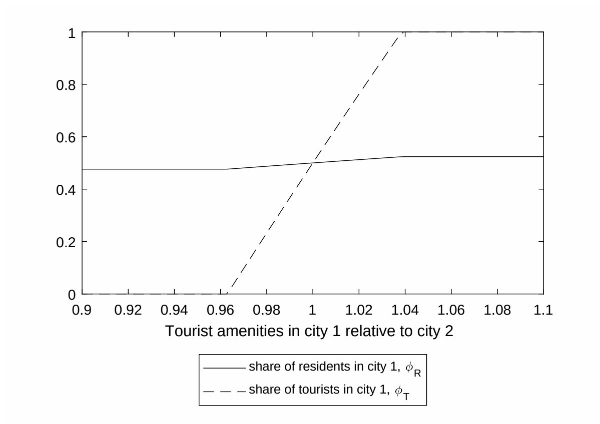


(b) Equilibrium with a tourist hub in city 2

Figure 3: Spatial equilibrium with weak consumption amenities and immobile residents



(a) Equilibrium share of city 1's employment in the non-tradable sector with respect to total employment in the city



(b) Equilibrium share of residents and tourists in city 1 with respect to the total number of residents and tourists in the system of cities

Figure 4: Increasing historical amenties: Simulation for the two city model with mobile residents ($\varepsilon = 0.75$)

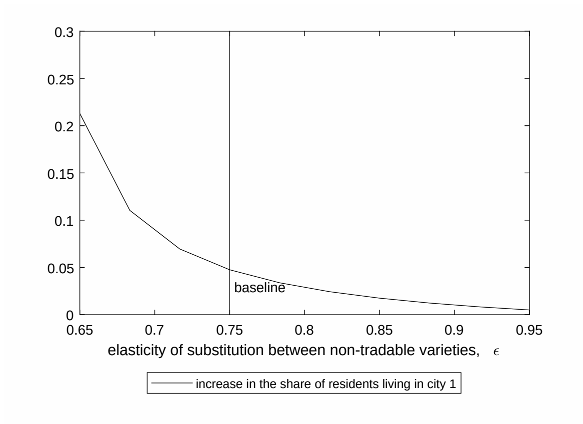


Figure 5: Large increase of historical amenities in city 1 (from $A_1 = 0.9$ to $A_1 = 1.1$ and increase in the share of residents, for different values of ε

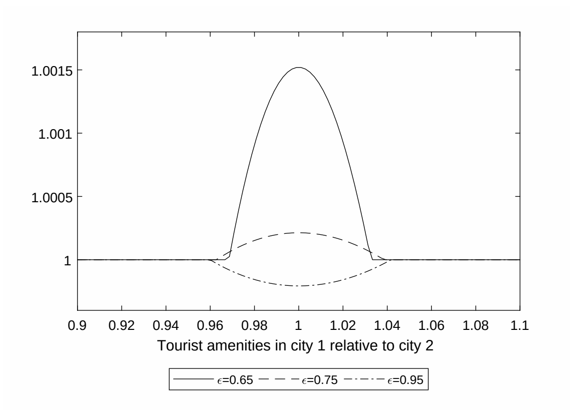


Figure 6: Individual welfare of residents in city 1

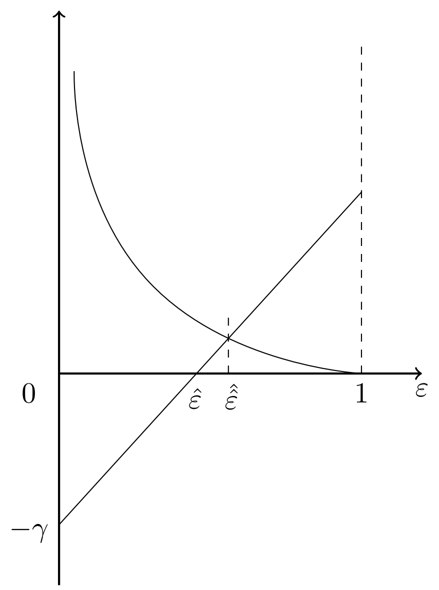
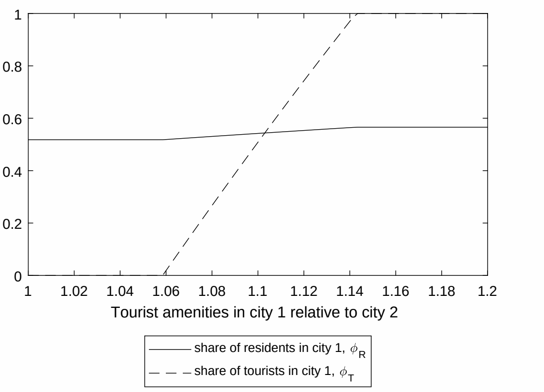
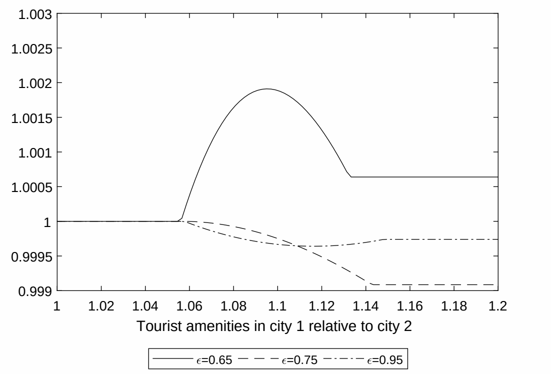


Figure 7: Graphical representation of the sufficient condition



(a) Equilibrium share of residents and tourists in city 1



(b) Individual welfare of residents in city 1

Figure 8: Spatial equilibrium and welfare for two cities with mobile residents and different productivity in tradables

B Online supplementary material to: "Tourism, amenities, and welfare in an urban setting"

Gianandrea Lanzara, G. Alfredo Minerva

B.1 Introduction

This supplement contains some additional material and extensions to our main analysis. Section B.2 extends the analysis presented in section 4.1 to the case where consumption amenities are strong. We show that the model has in this case a natural tendency to converge towards an equilibrium with agglomeration of tourists in a single destination that is due to a process of circular cumulative causation. Section B.3 presents an extension where we assume that the consumption basket of services for residents and tourists is different. We show that the main results concerning the welfare of residents and tourists in the single city setting are robust to the extension.

B.2 Spatial equilibrium with strong consumption amenities and immobile residents

When the non-tradable sector supplies highly differentiated varieties, $\varepsilon < \hat{\varepsilon}$, consumption amenities are strong. We study the consequences of this in the simpler framework of the two-city model with immobile residents. We still focus on the case where both cities keep producing tradable intermediate goods (partial specialization scenario) even if all tourists cluster into a single destination. According to proposition 3, tourists welfare is now increasing in the number of tourists visiting a city. The following property is satisfied:

$$\frac{\partial \Delta V_T(\phi_T)}{\partial \phi_T} > 0, \quad \text{for} \quad 0 < \phi_T < 1.$$

Whenever it exists, the interior spatial equilibrium is not stable. The only stable equilibria are the corner solutions, $\phi_T = 0$ and $\phi_T = 1$, where tourists cluster in one of the two cities. A highly differentiated non-tradable sector leads to the emergence of a *tourist hub*, since tourists keep flowing into one city in spite of rising prices. In order to know which city will become the tourist attractor we need to differentiate among different cases. First, consider the case where $\Delta V_T(0) < 0$ and $\Delta V_T(1) > 0$ (this case is depicted in figure B.1). In order to fulfill these two conditions the tourist potential of the two cities shall verify:

$$\frac{a_{k,1}n_{R,1}}{a_{k,2}n_{R,2}} + \frac{N_T I_T}{a_{k,2}n_{R,2}} < \frac{TP_1}{TP_2} < \frac{1}{\frac{a_{k,2}n_{R,2}}{a_{k,1}n_{R,1}} + \frac{N_T I_T}{a_{k,1}n_{R,1}}}.$$

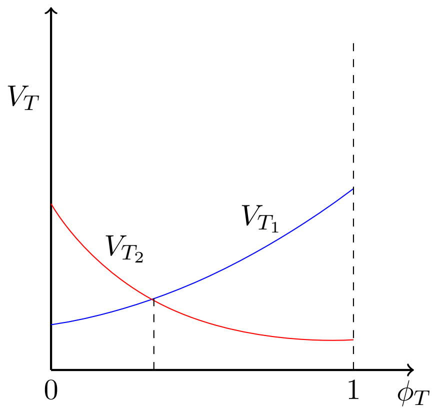


Figure B.1: Spatial equilibrium with strong consumption amenities and immobile residents

In such a case the interior equilibrium exists but is unstable. Accordingly, perturbing the interior equilibrium leads to the agglomeration of tourists in either city 1 or city 2, depending on the sign of the shock: shocks increasing the number of tourists in a city will eventually bring all tourists there. The second case occurs when $\Delta V_T(0) < 0$ and $\Delta V_T(1) < 0$, with tourists always heading to city 2. Finally, when $\Delta V_T(0) > 0$ this also implies that $\Delta V_T(1) > 0$, and city 1 will be the tourist hub.

A tourist hub, then, can emerge through two different economic channels. First, as shown in section 4.1, it can be a consequence of the fact that one city is more attractive in terms of some exogenous features, including those that enter our definition of tourist potential (*first nature* cause). Alternatively, when consumption amenities are strong, it can result from a *circular cumulative causation* process, such that a little initial advantage in terms of tourists eventually leads one city to absorb all of them (*second nature* cause). This pattern of results is reminiscent of the agglomeration patterns of the New Economic Geography literature.

B.3 Different services goods consumed by residents and tourists

In the baseline model we assume that residents and tourists consume the same goods. However, it can be argued that the consumption basket of residents and tourists is actually quite different. We examine this issue in the polar case where residents and tourists consume two disjoint sets of differentiated varieties. There is a sector r, which supplies differentiated varieties to residents, and a sector t, which supplies differentiated varieties to tourists (lower-case subscripts indicate the firm side, whilst upper-case letters indicate the consumer side). The CES bundle for residents is $C_R = \left(\int_0^{m_r} c_{Rj}^{\varepsilon} dj\right)^{\frac{1}{\varepsilon}}$, whereas for tourists it is $C_T = \left(\int_0^{m_t} c_{Tj}^{\varepsilon} dj\right)^{\frac{1}{\varepsilon}}$. We assume that the technology is the same in both sectors, and that labor is perfectly mobile, so that the wage is equalized. Since the marginal cost and the mark-up are the same, at the symmetric equilibrium all firms charge the same price: $p_{sr} = p_{st} = p_s$.

We first show that, in aggregate terms, this version of the model has the same equilibrium as in the baseline case, with $L_s = L_{sr} + L_{st}$ and $m = m_r + m_t$. The market clearing condition for the intermediate good is

$$m_r y_{kr} + m_t y_{kt} + (m_r + m_t)\eta = Y_k^o + X.$$

Using the first-order conditions from the firm's problem, we can rewrite the same condition in terms of labor

$$\frac{1-\alpha-\beta}{\alpha} wL_{sr} + \frac{1-\alpha-\beta}{\alpha} wL_{tr} + (m_r + m_t)\eta = wL_k + X.$$

Also note that the current account balance condition $X = n_T I_T$ still holds. Plugging this expression into the labor market clearing condition, $L_{sr} + L_{st} + L_k = n_R$, we obtain:

$$w(L_{sr} + L_{st}) = \frac{\alpha_s}{1-\beta_s}(a_k n_R + n_T) - (m_r + m_t)\eta.$$

Finally, we need a condition to express the labor force in the resident and in the tourist non-tradable sector as a function of the number of firms. Since firms in both sectors make zero profits, we have: $wL_{sr} = \frac{\alpha\varepsilon}{1-\varepsilon} m_r \eta$ and $wL_{st} = \frac{\alpha\varepsilon}{1-\varepsilon} m_t \eta$, given optimal firm behavior. Doing the final substitution, we get

$$m_r + m_t = \frac{1-\varepsilon}{1-\beta_s\varepsilon} \frac{wn_R + n_T I_T}{\eta},$$

which is the analogous of equation (12), and

$$w(L_{sr} + L_{st}) = \frac{\alpha_s\varepsilon}{1-\beta_s\varepsilon} \frac{wn_R + n_T I_T}{\eta},$$

which is the analogous of equation (11). These expressions imply that, in aggregate terms, the model has the same equilibrium as in the baseline case, with $L_s = L_{sr} + L_{st}$ and $m = m_r + m_t$. Total land demand for commercial purposes, H_s, is also equal to $H_{sr} + H_{st}$.

We now calculate the factor allocation between the resident and the tourist non-tradable sectors. To do so, we must turn to the demand side of the economy. Given that firms are symmetrical and prices are equalized between the resident and the tourist sector, the total demand for each variety in the two non-tradable sectors is given by:

$$n_R c_R = \frac{\gamma n_R I_R}{m_r p_s} = y_{sr},$$
$$n_T c_T = \frac{\gamma n_T I_T}{m_t p_s} = y_{st},$$

where, in each line, we have used the optimal consumer's demand and the market clearing condition. Since the size of the individual firm is the same in both sectors, we have $\frac{m_t}{m_r} = \frac{n_T I_T}{n_R I_R}$. As a last step, using the expression for $m_r + m_t$, we obtain:

$$m_r = \kappa_m \frac{(1+\kappa_q)a_k n_R + \kappa_q n_T I_T}{(1+\kappa_q)\eta},$$
$$m_t = \kappa_m \frac{n_T I_T}{(1+\kappa_q)\eta}.$$

Analogously, we can derive the share of the labor force employed in each of the two sectors:

$$\frac{L_{sr}}{n_R} = \frac{\alpha_s \varepsilon}{1-\beta_s \varepsilon}\left(1 + \frac{\kappa_q}{1+\kappa_q}\frac{N_T I_T}{a_k n_R}\right),$$
$$\frac{L_{st}}{n_T} = \frac{\alpha_s \varepsilon}{1-\beta_s \varepsilon}\frac{1}{1+\kappa_q}\frac{N_T I_T}{a_k n_R}.$$

These expressions allow to make some interesting points. First, tourism increases the relative size of the tourist sector, as the ratio m_t/m_r is increasing in the number of tourists (the same is true in terms of labor force). Second, the ratio m_t/m_r tends to a finite number $(1/\kappa_q)$ for $n_T \to \infty$; therefore, although the city eventually becomes fully specialized in non-tradable services, it never fully specializes in tourist services. In contrast, when the number of tourists is zero only the resident sector survives. Finally, both m_r and m_t are increasing in the number of tourists; therefore, even when residents and tourists consume different goods, tourism still increases consumption amenities for residents. The reason is that tourism makes residents richer via increased land income, and therefore raises their aggregate consumption demand allowing more firms to enter into the resident-related services sector.

What are the implications for welfare? Although the effect on consumption amenities is milder for residents, under the assumption that the number of residents is fixed at the urban level, the welfare impact of tourism is always positive for them. The proof follows the same steps as in section A.4.1. Turning to tourists, since the effect on consumption amenities is stronger for them, the impact of tourism on their own welfare becomes more favorable. Specifically, when consumption amenities are strong, $\varepsilon \leq \hat{\varepsilon}$, the welfare effect is always positive; however, even when consumption amenities are weak, $\varepsilon > \hat{\varepsilon}$, tourism may have a positive effect on the welfare of tourists. This happens when:

$$n_T I_T < \frac{\gamma(1-\varepsilon)}{\varepsilon - \gamma(1-\beta_s\varepsilon)} a_k n_R,$$

that is, when the number of tourists is low relative to the number of residents.