J. Regional Science Supplemental Appendix for "Tourism, amenities, and welfare in an urban setting"

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1 Introduction

This supplement contains some additional material and extensions to our main analysis. Section 2 extends the analysis 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 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.

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 1). In order to fulfill these two conditions the tourist potential of the two cities shall verify:

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

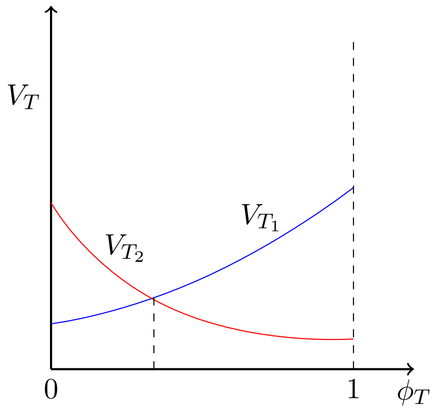

Figure 1: Spatial equilibrium with strong consumption amenities and immobile residents

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 the main text, 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.

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

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

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:

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

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: $w L_{sr} = \frac{\alpha\varepsilon}{1-\varepsilon} m_r \eta$ and $w L_{st} = \frac{\alpha\varepsilon}{1-\varepsilon} m_t \eta$, given optimal firm behavior. Doing the final substitution, we get

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

and

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

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:

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

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 the main text. 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.