DISCUSSION PAPER SERIES

DP16648

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INDUSTRIAL ORGANIZATION

MACROECONOMICS AND GROWTH

CEPR

ISSN 0265-8003

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Discussion Paper DP16648
Published 19 October 2021
Submitted 13 October 2021

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www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Industrial Organization
- Macroeconomics and Growth

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JEL Classification: N/A

Keywords: N/A

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Acknowledgements
We would like to thank seminar participants and discussants at Università di Roma "Tor Vergata", Università Bocconi, University of Bonn, University of Gothenburg and Universitat Autonoma de Barcelona, the CEPR Summer Symposium in Macroeconomics and the BGSE Summer Forum for useful comments and suggestions. Research assistance by Chiara Lacava and Gabriele Rovigatti is gratefully acknowledged. Claudio Michelacci acknowledges support from the European Research Council (ERC Advanced Grant 293692).

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Abstract

We propose a sufficient statistic to evaluate whether housing prices are inefficiently low for maximizing steady-state household welfare when housing has collateral value. The statistic is based on the insight that at the optimal housing price, the consumption gains induced by higher housing prices offset the welfare costs of a reduction in housing uses and household leisure. To apply the methodology, we use Italian data over the 1993-2006 period. As a source of exogenous variation for housing prices we rely on a share-shift instrument exploiting the facts that (i) owing to seminal historical and cultural episodes, foreign nationals have preferences for buying houses in different Italian provinces and (ii) shifts in a country's foreign investment are largely exogenous to the economic performance of specific Italian provinces. The data indicate that higher housing prices increase local consumption more than they decrease leisure and housing use by locals, suggesting that housing prices were inefficiently low.

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1 Introduction

Housing is a factor of production and also a durable consumption good that can be pledged to obtain financing. When the demand for housing increases and therefore its price rises, its user cost increases, reducing the consumption of housing services and use in production. But higher prices also increase the collateral value of housing, which expands the financial capacity of house owners and can foster economic activity if they are financially constrained. Much research has indeed emphasized that housing prices help to relaxing financial constraints on firms and households, promoting consumption and investment; see for example Jones, Midrigan, and Philippon (2011), Mian and Sufi (2011, 2013, 2014), Chaney, Sraer, and Thesmar (2012), Adelino, Schoar, and Severino (2015), and Schmalz, Sraer, and Thesmar (2017). Moreover private agents take prices as given and they do not internalize the effects of their choices on equilibrium prices, so there is a pecuniary externality that makes housing demand generally inefficient (Lorenzoni 2008). In this paper we propose a sufficient statistic to determine whether housing prices are inefficiently low for maximizing steady-state household welfare. We apply our logic to Italy, using foreign shocks to housing demand as exogenous shifters of housing prices, finding some support for the thesis of inefficiently low housing prices.

We consider a simple representative household economy where agents (households and firms) are financially constrained and housing has collateral value, i.e. can be pledged to obtain finance. Welfare depends on non-durable consumption, leisure, and housing services. The optimal housing price maximizes the steady-state welfare of the representative household. At this price an exogenous increase in demand has no effect on equilibrium welfare. When the price rises, housing becomes more expensive, which discourages its use for production or consumption, but the increase in its collateral value expands the financing capacity of the economy, which may stimulate production and hence consumption. The optimal price is the price at which the marginal consumption gains are equal to the marginal costs of the losses in housing services and leisure. This insight leads to a simple sufficient statistic to gauge the efficiency of housing prices. The statistic combines data on the elasticity of employment and consumption expenditures in goods and in housing services to changes in housing prices induced by exogenous demand shocks. We discuss how to extend the logic to allow for income effects in labor supply, spill-over across economies, and household heterogeneity.

We use our sufficient statistic to assess whether housing prices in Italy in 1993-2006 were optimal. To quantify the key elasticities, we rely on a share-shift instrument that exploits two facts. The first is that owing to seminal historical and cultural episodes relating to the long and varied history of Italian provinces, foreign nationals have preferences for buying houses in different Italian provinces. The second is that shifts in a country's foreign investment are largely exogenous to the economic performance of specific Italian provinces. The idea has been used before to instrument migration flows (Munshi 2003, Cortes 2008, Burchardi, Chaney, and Hassan 2019, Burchardi, Chaney, Hassan, Tarquinio, and Terry 2020, and Bursztyn, Chaney, Hassan, and Rao 2021). The application to housing is novel; it is possible thanks to a novel data set on housing foreign ownership by nationality, collected originally by the Bank of Italy for its current account statistics.

Foreign housing ownership is a significant factor in Italy, and we document important differences in geographical preference by nationality, whose origins can be traced to specific historical accidents. We find evidence that when a foreign country invests more internationally, housing prices in the Italian provinces favored by that country rise, which makes the instrument relevant. An increase in housing prices induced by foreign demand pushes up consumption and employment while reducing local households' use of housing. Higher prices drive up wages and increase firms' debt, which is consistent with the thesis that higher housing prices increase firm and household leverage, as in the collateral channel hypothesized by Chaney, Sraer, and Thesmar (2012). Housing prices have a stronger effect on consumption than on employment or local demand for housing: the housing price elasticities of employment and household demand are less than half the analogous elasticity of consumption. The point estimates of our sufficient statistic indicate that housing prices were inefficiently low over the period, suggesting that Italian households and firms were financially constrained. These effects might reflect the high home ownership rate of Italian households: as Schmalz, Sraer, and Thesmar (2017) observe, an increase in housing prices eases the financial constraint on agents only if the ownership rate is high.

A good number of papers have shown that the equilibrium price of collateral assets could be inefficient; see for example Lorenzoni (2008), Korinek (2011), Simsek (2013), Broer and Kero (2014) and Asriyan, Laeven, Martin, Van der Ghote, and Vanasco (2021). The welfare effects of housing demand have also been studied (Bajari, Benkard, and Krainer 2005, Calder-Wang 2021 and Farronato and Fradkin 2020). Here we focus on steady-state welfare, suggesting a sufficient statistic to determine optimal housing prices. Sufficient statistics have a long tradition in labor economics to study the efficiency of institutions (Baily 1978, Chetty 2006, and Michelacci and Ruffo 2015), but their application to the housing market and the use of the shift-share instrument for housing prices are both novel. The instrument exploits both cross-sectional and time series variation and might provide a feasible alternative to the widely used instrument for housing prices by Saiz (2010), based on cross-sectional, predetermined, geographic features of soil.

Since the pioneering contribution by Evans and Jovanovic (1989) and Chaney, Sraer, and Thesmar (2012), a substantial literature has examined how financial constraints and the value of collateral assets affect entrepreneurship, firm performance, and investment; see for example Schmalz, Sraer, and Thesmar (2017) and Hombert, Schoar, Sraer, and Thesmar (2020). Here we analyze the aggregate effects of foreign housing demand on household welfare, which is ultimately determined by consumption (of goods and housing services) and leisure. Catherine, Chaney, Huang, Sraer, and Thesmar (2021) also study the aggregate effects of collateral constraints using a calibrated quantitative model. Our methodology and the focus on household welfare offer a different, but complementary, perspective.

Section 2 introduces the sufficient statistic. Section 3 discusses the foreign housing demand instrument. Section 4 presents the evidence. Section 5 describes robustness checks and discusses income effects, geographical spill-overs, and household heterogeneity. Section 6 concludes.

2 Model

We use a simple general equilibrium model to justify the foreign demand instrument for housing prices, demonstrate the existence of an optimal, typically non-degenerate, housing price that maximizes the steady-state welfare of the representative household, and propose a metric to estimate whether a housing price is inefficiently low. These results, summarized in Propositions 1 and 2, are common to a vast class of models with a pecuniary externality. We conclude by discussing how the empirical strategy should be amended in extended versions of the model.

2.1 Baseline

Time t is discrete and there is no aggregate uncertainty apart from a once-and-for-all initial shock at time $t = 0$ to foreign housing demand, $\bar{b}$, or to government housing demand $\bar{l}_g$. We set the consumption good as the numeraire and adopt the convention that all equilibrium prices and quantities have no time subscripts. As in other models with financial frictions and heterogenous firms (Bernanke, Gertler, and Gilchrist 1998 and Jermann and Quadrini 2012), we postulate the existence of a representative (domestic) household. We start by assuming that the representative household maximizes

$$\sum_{t=0}^{\infty} \beta^t U(c_t + \varphi(h_t) - \psi(e_t)) \tag{1}$$

where c_t, h_t, and e_t are period t consumption of goods, housing services, and employment, respectively. $\beta \equiv \frac{1}{1+r} \in (0,1)$ is the subjective discount rate, the utility function U is increasing and concave, $\varphi(h) = \frac{\overline{\varphi}}{1-\frac{1}{\xi}} (h)^{1-\frac{1}{\xi}}$ and $\psi(e) = \frac{\overline{\psi}}{1+\frac{1}{\epsilon}} e^{1+\frac{1}{\epsilon}}$ with $\xi, \epsilon > 0$.

The household owns all local firms, has b_t foreign bonds that pays an interest rate r per period and owns l_{ot} housing units whose value is pl_{ot}. Household foreign wealth b_t evolves according to

$$b_{t+1} = (1+r) b_t + we_t + \Pi + pl_{ot-1} - c_t - pl_{ot} - u(h_t - l_{ot}) - T \tag{2}$$

where w is the wage, Π is aggregate profits, T is a lump sum tax, and $u = rp$ is the rental cost of housing—which implies that the household is indifferent between buying and renting. At $t = 0$ the household starts with an initial endowment of housing l_{o0} and of foreign bonds b_0. There is a fixed housing supply L. Housing demand comes partly from foreigners who spend $\bar{b}$ on domestic housing either as a private investment or for consumption (say tourism). Government can also demand housing l_g.[1] Government purchases are financed through the lump sum tax T.

Equilibrium for given housing price There are two types of firm, operating under perfect competition: financial intermediaries and a measure one of productive firms. Productive firms last for one period, are endowed with l housing units and choose the amount of intermediate capital k, labor e, and housing services l_f to produce consumption goods according to the Cobb-Douglas production function

$$y = k^{\alpha} e^{\theta} (l_f)^{\gamma}$$

[1] We think of l_g as capturing any government intervention to regulate the housing supply available to private agents; see Glaeser, Gyourko, and Saks (2005a, 2005b, 2006), Glaeser and Ward (2008) and Albouy and Ehrlich (2018) for a discussion of government housing regulation in the US.

where $\alpha, \theta, \gamma > 0$ and $\alpha + \theta + \gamma \leq 1$. To finance production, firms need to pay all factors of production in advance through intraperiod loans (from foreigners) equal to

$$d_t = k_t + we_t + rp\left(l_{ft} - l\right), \tag{3}$$

which is the sum of payments to capital, labor and house owners. As in Bernanke, Gertler, and Gilchrist (1998) and Christiano, Motto, and Rostagno (2014), we assume that borrowing involves an external finance premium $R_t \geq 1$ paid by firms to financial intermediaries. The premium depends on the ratio of firm leverage to the value of the collateral the firm can pledge, equal to $\phi(p)l \leq pl$, where $\phi'(p) \geq 1$.[2] The external finance premium is then equal to

$$R_t = R\left(\frac{d_t}{\phi(p)l}\right) \tag{4}$$

where $R(x) \geq 1$, $R', R'' \geq 0$ with $R = 1$ if $x \leq 0$, and $R' = R'' = 0$ at $x = 0$.[3]

Productive firms choose k_t, e_t, and l_{ft} to maximize profits

$$\pi_t = k_t^{\alpha} e_t^{\theta} \left(l_{ft}\right)^{\gamma} - R\left(\frac{d_t}{\phi(p)l}\right) d_t, \tag{5}$$

subject to (3). The first order conditions with respect to k and l_f yield

$$k = \frac{\alpha}{\theta} we \tag{6}$$

$$l_f = \frac{\gamma}{\theta rp} we \tag{7}$$

which can be substituted into the first order condition for e to obtain

$$(\alpha)^{\alpha} \left(\frac{\gamma}{rp}\right)^{\gamma} e^{\alpha+\theta+\gamma-1} = \left(\frac{w}{\theta}\right)^{1-\alpha-\gamma} \left[R\left(x\right) + R'\left(x\right) x\right] \tag{8}$$

where

$$x = \frac{\left(\alpha + \theta + \gamma\right) we - r\theta pl}{\theta\phi\left(p\right) l} \tag{9}$$

is the ratio between firm's debt and the pledgeable value of its collateral. The left-hand side of (8) is decreasing in e, while the right-hand side is increasing in both w and e, so (8) establishes a negative relation between w and e, which represents a labor demand schedule. For given p, the equilibrium wage $w(p)$ (a function of the housing price p alone) is obtained by combining the

[2] We abstract from the micro-foundations that give rise to the external finance premium in (4). Results are robust to alternative microfoundations for the financial friction, provided that aggregate welfare remains continuously differentiable in the equilibrium housing prices p.

[3] To guarantee an interior solution we could impose that $\lim_{x\to\infty} R(x) = \infty$. The following functional form satisfies all the required properties if $\eta > 1$:

$$R(x) = \begin{cases} 1 + \frac{\overline{R}}{1+\eta} x^{1+\eta} & \text{if} \quad x \geq 0 \\ 1 & \text{if} \quad x < 0 \end{cases}$$

labor demand schedule with the labor supply condition derived by maximizing (1) with respect to e

$$w = \psi'(e) = \overline{\psi} e^{\frac{1}{\epsilon}}. \tag{10}$$

The labor market clears at the point where the labor demand and labor supply schedules, $w(p)$ and $e(p)$, intersect. Intermediate capital k in (6) and firm housing demand l_f in (7) can then be expressed as a function of p, which we denote by $k(p)$ and $l_f(p)$, respectively. Given $e(p)$, $k(p)$, and $l_f(p)$ net output is equal to

$$\overline{y}(p) = [k(p)]^{\alpha} [e(p)]^{\theta} [l_f(p)]^{1-\alpha-\theta} - k(p). \tag{11}$$

The functions w, e, k, l_f and $\overline{y}$ are generally non monotonic in p. Intuitively, this is because they are equal to zero, both when p is equal to 0 and when p is equal to ∞.[4] As a result the effect of an increase in p on labor demand (and output) is ambiguous: labor demand can shift either upward (so employment increases) or downward (so employment falls). In the former case, the reduction in the finance premium due to the increase in collateral value dominates; in the latter the user cost effect dominates, as in the neoclassical model without financial frictions.

Housing market Households' demand for housing h (owned or rented) come from maximizing (1) and is given by

$$h = h(p) = \left(\frac{\overline{\varphi}}{rp}\right)^{\xi} \tag{12}$$

which is decreasing in p. Clearing of the housing market implies that

$$L - \bar{l}_g - \frac{\overline{b}}{p} = l_f(p) + h(p). \tag{13}$$

The left-hand side is housing supply net of government and foreigners' demand, which corresponds to the positively sloped relation in Figure 1. The right-hand side is the housing demand of the entire private sector (households plus firms). When financial friction is low, private housing demand $l_f(p) + h(p)$ is globally decreasing in p. When instead it is high enough, private housing demand could be first increasing and then decreasing, as in Figure 1, where the housing market equilibrium corresponds to point A. The conclusion is set out in the following proposition:

Proposition 1 (Exclusion restriction) *The equilibrium housing price is a function of housing demand by government $\bar{l}_g$ and foreigners $\overline{b}$:*

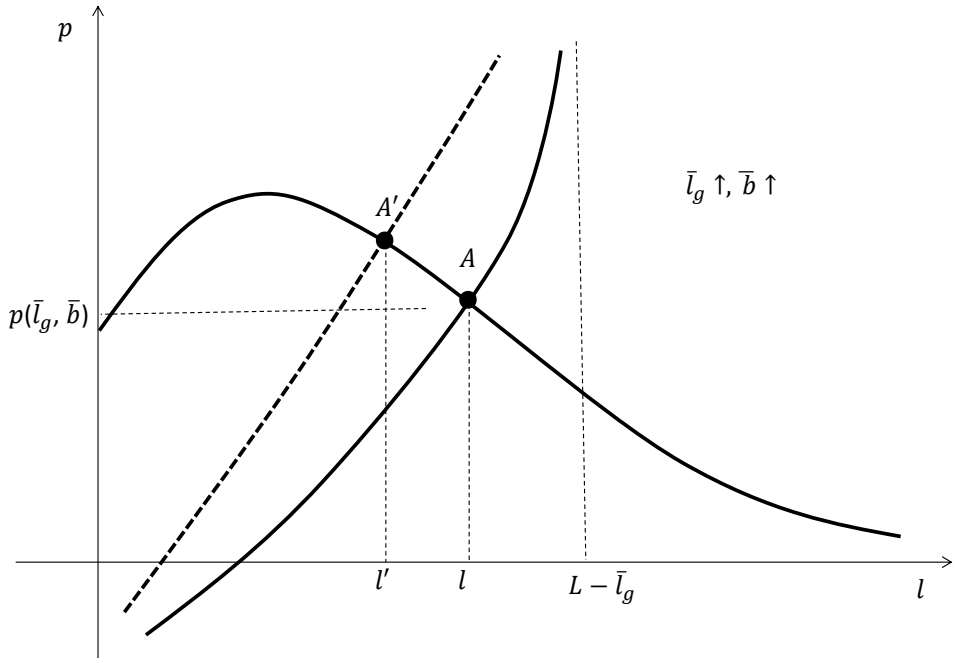
$$p = p(\bar{l}_g, \overline{b}) \tag{14}$$

Since net output $\overline{y}(p)$, employment $e(p)$, and household demand for housing services $h(p)$ are function exclusively of the housing price p, equation (14) justifies using foreign housing demand $\overline{b}$ as an instrument for p to dtermine its effects on output, employment and housing services.

[4]When $p = 0$, and $\lim_{x\to\infty} R(x) = \infty$, this happens because the external finance premium is prohibitively high. When p goes to infinity, this happens because the user cost of housing becomes prohibitively high. Either way output drops to zero.

For simplicity, we assume that the equilibrium housing price $p(\bar{l}_g, \bar{b})$ in (14) is unique, so that the two schedules in Figure 1 intersect just once, as in Figure 1.[5]

Figure 1: The equilibrium housing price p



Clearing of the goods market The Euler equation for consumption implies that household consumption c is constant, equal to net output in (11) plus the return on the sum of initial foreign bonds b_0 and foreign wealth transfer due to foreign housing demand $\overline{b}$.[6] As a result:

$$c\left(p, \overline{b}\right) = \overline{y}\left(p\right) + r\left(b_0 + \overline{b}\right). \tag{15}$$

Equilibrium The equilibrium is a tuple $(e(p), w(p), l_f\left(p\right), k(p), \overline{y}(p), h(p), c\left(p, \overline{b}\right), p)$ such that firms maximize profits, the household maximizes utility, and the markets for labor, housing, and goods clear, so that (8), (10), (13), and (15) are satisfied.

Optimal price of housing We consider a benevolent government that regulates the private supply of housing by choosing $\bar{l}_g \geq 0$.[7] The government's Ramsey problem is as follows:

$$W^* = \max_{\bar{l}_g \geq 0} \left[\frac{U(\overline{y}\left(p\right) + r\left(b_0 + \overline{b}\right), h(p), e(p))}{1-\beta} \right] \tag{16}$$

[5]When there are multiple equilibria, our sufficient statistic below detects whether the current equilibrium is locally efficient: the statistic just identifies the welfare effects of marginal changes in housing prices.

[6]This follows from the assumptions that the finance premium in (4) is a tax that involves no output costs and the household appropriates all firm profits Π_t equal to the sum of π_t in (5), and the profits of financial intermediaries so that $\Pi_t = \pi_t + (R_t - 1)\, d_t$.

[7]The government could also control the housing price by subsidizing or taxing house purchases. Such policy instruments introduce a wedge between the purchase and the sales price, whose effects vary with the exact microfoundation for the financial constraint.

which is subject to the equilibrium housing price in (14). Notice that, since $\bar{l}_g$ implies a given housing price in (14), we can suppose that the government can choose any p greater than $\underline{p} = p(0, \bar{b})$—i.e. the price under a perfectly liberalized housing market. This means that the problem in (16) can be expressed as:

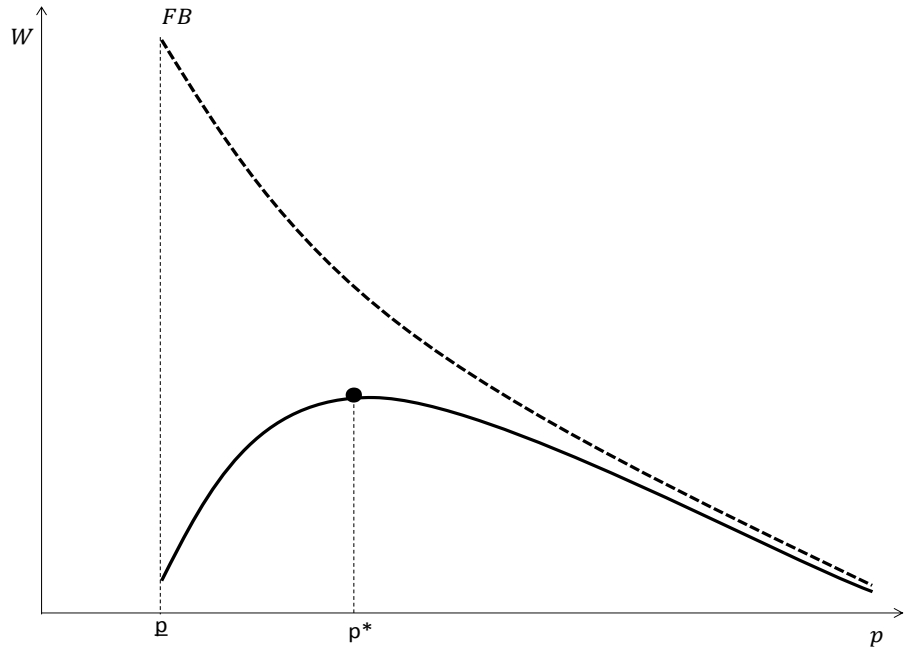
$$\begin{aligned} W^* &= \max_p \left[\frac{U(c\left(p, \bar{b}\right), h(p), e(p))}{(1-\beta)} \right] \\ &\text{subject to} \\ p &\geq \underline{p} = p(0, \bar{b}). \end{aligned} \tag{17}$$

When $p > \underline{p}$, the optimal housing price p^* satisfies the following first order condition

$$\frac{dU}{dp} = 0,$$

which would correspond to p^* in Figure 2. In the absence of financial frictions with $\bar{b} = 0$, $dU/dp < 0 \ \forall p \geq \underline{p}$, and the optimal housing price is $\underline{p}$. This would correspond to the line FB in Figure 2. If $dU/dp > 0$ the price is too low, if $dU/dp < 0$ it is too high. Essentially there are two reasons why housing prices could be too low: why p^* could be greater than $\underline{p}$. First, foreign housing demand is not fully elastic to the price so higher prices allow extracting higher rents from foreigners. Secondly, there is a pecuniary externality (Lorenzoni 2008) owing to financial frictions and the value of collateral: higher housing prices increase the financial capacity of firms and stimulate output and employment. These pecuniary externalities imply that higher housing prices bring higher wages and employment and more firm debt.

Figure 2: The optimal housing price p^*



We denote the net labor share by

$$\mu_e = \frac{\psi'(e)\, e}{c} = \frac{we}{c} \tag{18}$$

and the ratio between household expenditure in housing and total consumption by

$$\mu_h = \frac{\varphi'(h)\, h}{c} = \frac{uh}{c}. \tag{19}$$

By deriving U in (1) with respect to p and multiplying the resulting expression by $\frac{p}{U_c c}$ we obtain that

$$\frac{dU}{dp} \simeq H \equiv \eta_c + \mu_h \eta_h - \mu_e \eta_e \tag{20}$$

where $\simeq$ means same sign as and

$$\eta_j \equiv \frac{d \ln [j(p)]}{d \ln p}$$

denotes the elasticity of variable $j = c, e, h$ with respect to the housing price p. H in (20) measures the percentage increase in consumption equivalents to a 1-percent increase in housing prices induced by an exogenous change in (government) housing demand. The first term of H is the contribution of consumption to welfare. The second term takes into account that a higher housing price reduces the housing demand of (local) households. The third term measures leisure costs. H provides a sufficient statistic to detect whether housing prices are inefficiently low. In summary:

Proposition 2 (The optimal housing price) *With financial frictions, the housing price p^* that maximizes steady state welfare is typically non degenerate (neither equal to $\underline{p}$ nor equal to infinity) and makes the statistic H in (20) exactly equal to zero. When H is positive the equilibrium housing price p is inefficiently low.*

Empirically, we can evaluate H in (20) by exploiting the exclusion restriction implied by (14) in Proposition 1: changes in foreign housing demand $\bar{b}$ affect employment $e(p)$ and household demand for housing $h(p)$ exclusively through the housing price $p = p(\bar{l}_g, \bar{b})$. This implies that by instrumenting the housing price p with $\bar{b}$ we can estimate the employment elasticity η_e and the housing elasticity η_h. For consumption, however, the exclusion restriction is violated, as consumption in (15) depends not only on the housing price p but also on the foreign wealth transfer $\bar{b}$. To evaluate η_c, we use information on the reduced-form elasticity of consumption c to a change in foreign housing demand $\bar{b}$, which after using (15) can be written as

$$\frac{d \ln \left[c\left(p(\bar{l}_g, \bar{b}), \bar{b}\right)\right]}{d \ln \bar{b}} = \frac{\partial \ln \left[c\left(p, \bar{b}\right)\right]}{\partial \ln p} \cdot \frac{\partial \ln \left[p(\bar{l}_g, \bar{b})\right]}{\partial \ln \bar{b}} + \frac{r\bar{b}}{c},$$

which allows to express $\eta_c \equiv \partial \ln c / \partial \ln p$ as equal to

$$\eta_c \equiv \frac{\partial \ln \left[c\left(p, \bar{b}\right)\right]}{\partial \ln p} = \left(\frac{d \ln c}{d \ln \bar{b}} - \frac{r\bar{b}}{c}\right) \frac{1}{\varkappa} \tag{21}$$

where

$$\varkappa \equiv \frac{d \ln \left[p(\bar{l}_g, \bar{b})\right]}{d \ln \bar{b}}$$

denotes the elasticity of housing prices p to foreign housing demand $\bar{b}$. We use (21) to evaluate η_c in (20) by calculating its three components separately: (i) the reduced form elasticity of consumption to foreign housing demand $d \ln c / d \ln \bar{b}$; (ii) the ratio of foreign wealth invested in local housing (at historical costs) to consumption $r\bar{b}/c$; and (iii) the elasticity of housing price to foreign housing demand $\varkappa$, which corresponds to the regression coefficient of the first stage regression of housing prices on foreign demand.[8]

2.2 Further discussion

In Appendix O1 we extend the model by allowing for (i) income effects in labor supply and housing demand, (ii) geographical spill-overs across regions, (iii) transitional dynamics, and (iv) household heterogeneity. Here we report on the main implications for the empirical analysis.

Income effects With preferences that allow for income effects, for example

$$U(c, h, e) = u(c) + \varphi(h) - \psi(e)$$

with $u' > 0$ and $u'' < 0$, the equilibrium housing price is a function of government housing demand $\bar{l}_g$ and foreign housing demand $\bar{b}$ as in (14) but also of consumption c so that now

$$p = p(\bar{l}_g, c, \bar{b}). \tag{22}$$

As in (15), equilibrium consumption c can again be expressed as a function of both p and $\bar{b}$: $c = c\left(p, \bar{b}\right)$. Aggregate welfare in the income-effects version of the model becomes

$$W^I = \frac{u\left(c\left(p, \bar{b}\right)\right) + \varphi\left(h(p, c\left(p, \bar{b}\right))\right) - \psi(e(p, c\left(p, \bar{b}\right)))}{1 - \beta}$$

which allows us to write

$$\frac{dW^I}{dp} \simeq H^I \equiv \mu_c \cdot \frac{\partial \ln \left[c\left(p, \bar{b}\right)\right]}{\partial \ln p} + \mu_h \cdot \frac{\partial \ln \left[h\left(p, c\right)\right]}{\partial \ln p} - \mu_e \cdot \frac{\partial \ln \left[e\left(p, c\right)\right]}{\partial \ln p} \tag{23}$$

where μ_e and μ_h are still given by (18) and (19) while

$$\mu_c = 1 + \mu_h \frac{\partial \ln \left[h\left(p, c\right)\right]}{\partial \ln c} - \mu_e \frac{\partial \ln \left[e\left(p, c\right)\right]}{\partial \ln c}. \tag{24}$$

The equilibrium housing price p is inefficiently low whenever H^I in (23) is positive. The components of H^I can be estimated as follows. The elasticity $\partial \ln c / \partial \ln p$ can still be estimated as in (21). The elasticities $\partial \ln h / \partial \ln p$ and $\partial \ln e / \partial \ln p$ can be estimated by instrumenting the housing price with foreign housing demand $\bar{b}$ after controlling for consumption. The regression coefficients for consumption provide the estimates $\partial \ln h / \partial \ln c$ and $\partial \ln e / \partial \ln c$ needed to estimate μ_c in (24).

[8] Notice that the derivation of (21) uses the fact that foreign housing demand has unit-elasticity with respect to housing prices, as commonly maintained in the literature (Davis and Ortalo-Magné 2011). If the elasticity is instead greater than one (Piazzesi et al. 2007), (21) provides a lower estimate for the consumption elasticity η_c. This guarantees that H remains a sufficient statistic to detect whether housing prices are inefficiently low.

Spill-overs We now discuss the implications of technological spill-overs and capital income transfers across regions. The economy has I perfectly symmetric regions, each characterized by a representative household $i = 1, ...I$. Foreign housing demand in region i is denoted by $\overline{b}_i$, equal across regions. Household i has claims $\kappa \geq 1/2$ to the profits of firms in region i and rights $(1-\kappa)/(I-1)$ over firms' profits in any region other than i. The total dividend payments to household i are equal to

$$D_{it} = \kappa \Pi_{it} + (1-\kappa) \sum_{j \neq i} \frac{\Pi_{jt}}{I-1},$$

where Π_{jt} denotes aggregate profits in region j. There are spill-overs to production in region i from production in other regions, so that output in region i is equal to

$$y_i = A(\overline{\mathbf{y}}_{-\mathbf{i}}) k_i^{\alpha} e_i^{\theta} \left(l_{f_i}\right)^{\gamma}$$

where the TFP A of region i depends on the production in all the other regions collected in the vector $\overline{\mathbf{y}}_{-\mathbf{i}}$ of dimension $I-1$.[9] The equilibrium housing price in region i now becomes function of foreign housing demand in the local region $\overline{b}_i$ and in all the other regions $\overline{\mathbf{b}}_{-\mathbf{i}}$ so that

$$p_i = p\left(\overline{l}_g, \overline{b}_i, \overline{\mathbf{b}}_{-\mathbf{i}}\right) \tag{25}$$

Under symmetry, consumption in region i is equal to consumption in each of the other regions and equal to

$$c_i = c\left(p_i, \mathbf{p}_{-\mathbf{i}}, \overline{b}_i\right) = \overline{y}\left(p_i, \mathbf{p}_{-\mathbf{i}}\right) + r\left(b_0 + \overline{b}_i\right) \tag{26}$$

Aggregate welfare, obtained by summing the welfare of all representative households, is

$$W^S = \sum_{i=1}^{I} \frac{U(c\left(p_i, \mathbf{p}_{-\mathbf{i}}, \overline{b}_i\right), h(p_i), e(p_i, \mathbf{p}_{-\mathbf{i}}))}{1-\beta},$$

where we used the fact that household demand for housing services is still determined by (12) with or without technological spill-overs and so remains a function of local prices alone. In symmetric equilibrium (and after taking a region i as reference region) we can then write

$$\frac{dW^S}{dp_i} \simeq H^S \equiv \eta_c^S + \sigma_h \eta_h^S - \sigma_e \eta_e^S \tag{27}$$

where σ_e and σ_h are still given by (18) and (19), while the elasticities of consumption, household demand for housing and employment to housing prices are equal to

$$\eta_c^S = \sum_{j=1}^{I} \frac{\partial \ln \left[c\left(p_i, \mathbf{p}_{-\mathbf{i}}, \overline{b}_i\right)\right]}{\partial \ln p_j} \tag{28}$$

$$\eta_h^S = \frac{d \ln h\left(p_i\right)}{d \ln p_i} \tag{29}$$

$$\eta_e^S = \sum_{j=1}^{I} \frac{\partial \ln \left[e\left(p_i, \mathbf{p}_{-\mathbf{i}}\right)\right]}{\partial \ln p_j} \tag{30}$$

[9] This might be due to a pure technological externality as in Romer (1986) or to terms of trade effects.

The elasticities η_c^S and η_e^S incorporate how the equilibrium price of one region spills overs to others. With geographical spill-overs, the equilibrium housing prices are inefficiently low whenever H^S in (27) is positive. All components of H^S can be estimated by allowing employment and consumption to depend on the housing price in the local region, p_i, as well as on the prices in all the other regions $\mathbf{p_{-i}}$. The demand for housing services in region i is a function only of the local price p_i because housing demand remains determined by (12) with or without technological spill-overs, so η_h^S is unchanged relative to the model without spill-overs. The elasticity η_e^S can be recovered by allowing employment in region i to be affected by the local price and the price in all the other regions, whose coefficients can be estimated using foreign demand in all regions $\overline{\mathbf{b}} = [\overline{b}_1, \overline{b}_2, ...\overline{b}_I]$ as a vector of instruments. The consumption elasticity η_c^S is recovered by observing that the following matrix relation between reduced-form consumption elasticities and price elasticities holds under symmetry

$$\frac{\mathbf{dc}}{\mathbf{d\overline{b}}} = \frac{\mathbf{r\overline{b}}}{\mathbf{c}} + \frac{\mathbf{dp}}{\mathbf{d\overline{b}}} \times \frac{\boldsymbol{\partial}\mathbf{c}}{\boldsymbol{\partial}\mathbf{p}} \tag{31}$$

where we have defined the two column vectors of derivatives $\frac{\mathbf{dc}}{\mathbf{d\overline{b}}} = \left[\frac{d\ln c\left(p_i,\mathbf{p_{-i}},\overline{b}_i\right)}{d\ln \overline{b}_1}, ...\frac{d\ln c\left(p_i,\mathbf{p_{-i}},\overline{b}_i\right)}{d\ln \overline{b}_I}\right]$, and $\frac{\boldsymbol{\partial}\mathbf{c}}{\boldsymbol{\partial}\mathbf{p}} = \left[\frac{\partial\ln c\left(p_i,\mathbf{p_{-i}},\overline{b}_i\right)}{\partial\ln p_1}, ...\frac{\partial\ln c\left(p_i,\mathbf{p_{-i}},\overline{b}_i\right)}{\partial\ln p_I}\right]$, the column vector of dimension I with non-zero entry just in row i, when it is equal to $r\overline{b}/c$ $\frac{\mathbf{r\overline{b}}}{\mathbf{c}} = \left[0...0, \frac{r\overline{b}}{c}, ...0\right]$ and the Jacobian matrix

$$\frac{\mathbf{dp}}{\mathbf{d\overline{b}}} = \begin{bmatrix} \frac{\partial\ln p_1(\overline{\mathbf{b}})}{\partial\ln \overline{b}_1} & \cdots & \frac{\partial\ln p_I(\overline{\mathbf{b}})}{\partial\ln \overline{b}_1} \\ \frac{\partial\ln p_1(\overline{\mathbf{b}})}{\partial\ln \overline{b}_2} & \cdots & \frac{\partial\ln p_I(\overline{\mathbf{b}})}{\partial\ln \overline{b}_2} \\ \vdots & \ddots & \vdots \\ \frac{\partial\ln p_1(\overline{\mathbf{b}})}{\partial\ln \overline{b}_I} & \cdots & \frac{\partial\ln p_I(\overline{\mathbf{b}})}{\partial\ln \overline{b}_I} \end{bmatrix}. \tag{32}$$

Inverting (31) yields the following expression for the elasticity of consumption to prices

$$\frac{\boldsymbol{\partial}\mathbf{c}}{\boldsymbol{\partial}\mathbf{p}} = \left(\frac{\mathbf{dp}}{\mathbf{d\overline{b}}}\right)^{-1}\left(\frac{\mathbf{dc}}{\mathbf{d\overline{b}}} - \frac{\mathbf{r\overline{b}}}{\mathbf{c}}\right) \tag{33}$$

This is the system counterpart with spill-overs of the equation in (21). The elasticity η_c^S is the sum of all the elements in the column vector $\frac{\boldsymbol{\partial}\mathbf{c}}{\boldsymbol{\partial}\mathbf{p}}$ in (33), $\eta_c^S = Sum\left(\boldsymbol{\partial}\mathbf{c}/\boldsymbol{\partial}\mathbf{p}\right)$.

Heterogeneity Households could differ in wealth, labor efficiency or asset portfolios. Aggregate welfare (the sum of all household utilities) then depends both on average consumption, employment, and uses of housing as well as on the cross-sectional dispersion of these variables and their covariances. The exclusion restriction implied by (14) remains valid, but now changes in housing prices impact on aggregate welfare through aggregate means as well as through higher-order cross-sectional moments. In the empirical analysis below we find that the effects on higher order-moments are quantitatively small and statistically insignificant.

Transitional dynamics In the model, firms last just one period and are born with the same amount of housing units l, so the economy is always in steady state. We could extend the model to allow firms to accumulate internal wealth over time and then die with probability δ. In this case past housing price shocks matter for current consumption, leisure, and household demand for housing. The analysis of welfare effects should then be extended to allow for lagged effects of housing prices. In practice in the analysis below we find that the effect of lagged price changes is similar to that of current price changes, which suggests that the elasticities on impact identify long-run steady-state outcomes.

3 Empirical specifications and data

We consider Q Italian provinces indexed by q. We discuss how we estimate the elasticities η_c, η_h, and η_e and the welfare statistic H in (20) by using the foreign demand for housing in province q, $\overline{b}_q$, as an instrument for housing prices in that province p_{qt}. We conclude by discussing the data, the sources of the differences in geographical preferences across nationalities, and additional variables used in the analysis.

3.1 Strategy

To estimate the elasticity of employment η_e and household demand for housing η_h, we run the following regressions:

$$\ln y_{qt} = \eta_y \ln p_{qt} + \beta' X_{qt} + \text{error} \tag{34}$$

where y_{qt} denotes employment if $y = e$, or housing services if $y = h$ in year t and province q and p_{qt} is the housing price in province q at t. X_{qt} is a set of controls which includes a full set of province and time dummies. When allowing for income effects, X_{qt} also includes log consumption; see (23) and (24). With spill-overs, it includes housing prices in other regions.

Since housing prices are endogenous, we rely on Proposition 1 and instrument p_{qt} with shifts to the foreign demand for housing in province q at t, denoted by $\overline{b}_{qt}$, using two stage least squares. The first stage regression is as follows:

$$\ln p_{qt} = \zeta \phi_q \ln \overline{b}_{qt} + \beta' X_{qt} + \text{error} \tag{35}$$

where $\overline{b}_{qt}$ is foreign housing demand and ϕ_q measures its importance in the housing market of province q. The regression coefficient $\varkappa_q = \zeta \phi_q$ in (35) is the elasticity of housing prices in province q to foreign demand $\overline{b}_{qt}$.[10] The coefficient $\varkappa$ in (37) corresponds to

$$\hat{\varkappa} = \hat{\zeta} E(\phi_q) \tag{36}$$

where a "$\widehat{\ }$" denotes an estimate of the corresponding parameter and $E(\phi_q)$ is the cross-sectional average value (across provinces) of ϕ_q.

[10]The idea is that the elasticity of housing prices to foreign demand $\overline{b}_{qt}$ depends on the relative importance of foreign demand in the province. If foreign demand represents a tiny fraction of the local housing market, a given percentage increase in foreign demand will shift the housing price in the province only marginally.

To estimate the consumption elasticity η_c, we first run the reduced form regression

$$\ln c_{qt} = \nu\phi_q \ln \overline{b}_{qt} + \beta' X_{qt} + \text{error} \tag{37}$$

where $\nu E(\phi_q)$ measures $d \ln c / d \ln \overline{b}$ in (21). The elasticity η_c is then estimated as:

$$\hat{\eta}_c = \frac{\hat{\nu}}{\hat{\zeta}} - \frac{r\overline{b}}{\hat{\varkappa} c}. \tag{38}$$

The first term in (38) is an estimate for $\partial \ln c / (\varkappa \partial \ln p)$ in (21) and is obtained by taking the ratio between the estimate of ν in (37) and the estimate of ζ in (35); the second term in (38) takes the imputed ratio between the capital income from the foreign wealth invested in local housing (at historical costs) and consumption $r\overline{b}/c$, and then divides it by the estimate $\hat{\varkappa}$ in (36).

We estimate the percentage increase in consumption equivalents induced by a 1-percent increase in housing prices, corresponding to H in (20), as follows

$$\hat{H} = \hat{\eta}_c + \mu_h \hat{\eta}_h - \mu_e \hat{\eta}_e \tag{39}$$

where $\hat{\eta}_c$ is given in (38) while the elasticity of housing demand to housing prices $\hat{\eta}_h$ and the analogous employment elasticity $\hat{\eta}_e$ are estimated by running the two stage-least square regression in (34). μ_h is the imputed ratio of expenditure in housing services over consumption, which measures the contribution of housing services to household welfare. μ_e is the imputed net labor share (labor income over consumption expenditure) which measures the contribution of leisure to household welfare.

Foreign demand for housing in province q is the sum of its demand from foreigners from any country $s = 1, 2...S$ in the world (excluding Italy) and is calculated as follows:

$$\overline{b}_{qt} = \frac{\sum_{s=1}^{S} o_{qs} f_{st}}{\sum_{s=1}^{S} O_s} \tag{40}$$

where $f_{st} \equiv \frac{F_{st}}{N_s}$ denotes the foreign assets of country s in per capita terms (i.e. scaled by the population of country s), o_{qs} is the (average over time) number of foreigners from country s who own a house in province q, and O_s is the total number of housing owners from country s:

$$O_s \equiv \sum_{q=1}^{Q} o_{qs}.$$

To motivate (40), we model the portfolio choices of foreigners. Let F_{st} denote the foreign assets of country s at time t, evolving over time due to fluctuations in that country's income, wealth or demography. We assume that country s invests a share α_s of its wealth in Italian housing and a share $\sigma_{qs} = o_{qs}/O_s$ of the investment goes to province q—in line with the evidence that portfolio shares are relatively constant over time (Kraay and Ventura 2000).[11] As a result

[11] Generally α_s measures the attractiveness of the Italian housing market for foreigners of nationality s while σ_{qs} measures the relative attractiveness of province q for nationality s with $\sum_{q=1}^{Q} \sigma_{qs} = 1$.

$\sigma_{qs}\alpha_s F_{st}$ represents the investment by country s in the housing of province q. The foreign demand for housing in province q in (40) is obtained by summing across all countries in the world their corresponding demand for province-q housing equal to

$$\sum_{s=1}^{S} \sigma_{qs}\alpha_s F_{st},$$

which corresponds to (40) assuming that

$$\alpha_s = \overline{\alpha}\frac{O_s}{\sum_{j=1}^{S} O_j} : \frac{N_s}{N^W}. \tag{41}$$

In (41), N_s denotes the population of country s while $N^W \equiv \sum_{s=1}^{S} N_s$ is the world population. Notice that the constant $\overline{\alpha}$ and the time variation in the world population are irrelevant to the estimate: the former is absorbed by the constant, the latter by the time dummies. So $\overline{\alpha}$ is normalized to one and N^W is the average world population over the sample period.[12]

The importance of foreigners in the housing market of province q, ϕ_q, is measured by the share of foreign owners in the total number of households in the market equal to

$$\phi_q = \frac{\sum_{j=1}^{S} o_{qj}}{\sum_{j=1}^{S} o_{qj} + \widetilde{o}_q} \tag{42}$$

where $\widetilde{o}_q$ is the number of local households resident in province q.

3.2 The Data

Table 1 reports the descriptive statistics for the main variables in the analysis. Appendix O2 gives the full details of the data set. Our main data sources are the Survey of International Tourism (SIT) and the Survey of Income and Wealth (SHIW)—both by the Bank of Italy—, the Labor Force Survey ("Rilevazione Continua sulle Forze di Lavoro," LFS) of the Italian Statistical Institute (ISTAT), and External Wealth of Nations (EWN) by Lane and Milesi-Ferretti (2007). We also use sector-level import and export data between each province and any foreign country from the ISTAT's Coeweb data-set, firm level data from the Italian Chamber of Commerce network (CERVED), additional aggregate statistics of countries from the Penn World Table 8.1 (PWT) or EUROSTAT, and sectoral country data from the OECD STAN database. All individual level data for households (SHIW, SIT, LFS) or firms (CERVED) are aggregated at the province level using the survey-provided sample weights and converted into per capita terms using the working age population (15-64) in the province from the survey or from LFS (if unavailable in the survey).[13] Values are expressed in 1990 Euros using the national CPI.

The waves of the SHIW (generally biannual but sometimes triennial) dictate the sample years: 1993, 1995, 1998, 2000, 2002, 2004, and 2006.[14] We focus on a stable set of 84 provinces

[12]Notice that this also implies that the amount of foreign wealth invested in Italian housing (the value of $\overline{b}$ in the model) is not identified by the regressions.

[13]Households are assigned to the province where they reside, firms to the province of their headquarters.

[14]For the SHIW waves after 2006, we cannot assign households to their province of residence because we have no access to the province level identifier in SHIW.

Table 1: Summary statistics

Variable	N	Mean	St. dev.	5^{th} pctile	95^{th} pctile
Attractiveness of Italy to country s, α	160	3.56	17.91	0.00	9.79
Relative attractiveness of province q, σ	13440	0.01	0.06	0.00	0.02
Importance of foreign demand in province q, ϕ	84	0.03	0.04	0.01	0.10
Population	84	683,384	706,806	200,101	2,009,322
Foreign demand (in US dollars), $\bar{b}$	588	131	255	6	529
Total consumption expenditures	588	5,100	1,404	2,968	7,329
Employed over population	588	0.55	0.09	0.40	0.67
Housing services expenditures	588	1,029	203	749	1,378
Housing price (quality adj)	588	5.76	0.32	5.25	6.27
Monthly wage	588	1,238	414	703	1,808
Firm bank debt	588	290,218	172,059	95,057	567,621

Notes: Summary statistics for the provinces always present in the data; the sample years are 1993, 1995, 1998, 2000, 2002, 2004, and 2006. Total and nondurable consumption expenditures, monthly wages, housing services and firm debt are expressed in 1990 Euros. Foreign demand $\bar{b}$ is at constant US dollars. House price is an hedonic index in percentage deviations (log Euros), see Appendix O2 for the full details.

consistently defined through time and with full data information across datasets.[15] The smallest Italian provinces have a population of around 200,000 residents, while only the four largest (Rome, Milan, Naples, and Turin) have population over 2 million. Panels (a) and (b) of Figure 3 show the evolution of real GDP and real consumption per capita in Italy (from PWT) in our sample years and the fluctuations of the employment and unemployment rates (from EUROSTAT): the economy grows at a relatively constant growth rate and the data covers one full business cycle in the labor market.

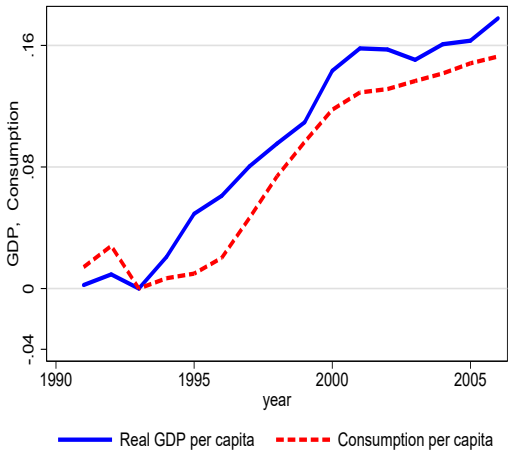
SIT plays an important role in the analysis. To compile official current account statistics and in consideration of the importance of foreigners for the Italian economy, SIT interviews a representative sample of foreigners at all points of entry to Italy (national borders, ports, airports, train stations) and ask their nationality, the reason for the visit to Italy (business or tourism), their expenditures during their visit, the provinces they will visit, whether they own a house in Italy and if so where. SIT is run yearly and allows us to calculate, separately for each nationality s, the number of foreign home owners in any Italian province q, i.e. the value of o_{qs} $\forall q, s$. Given the limited sample size of SIT (around 140,000 foreigners per wave) and the large number of o_{qs}'s to evaluate (some 10,000), o_{qs} is calculated by averaging all the waves of SIT (from 1996 to 2013).

To calculate the foreign demand instrument $\bar{b}_{qt}$ in (40) we combine the o_{qs}'s with the foreign assets of country s at t, F_{st}, from EWN, which is equal either to gross Foreign Direct Investment (FDI) of country s or to its gross Total Assets, with FDI assets being our favorite measure.[16] We

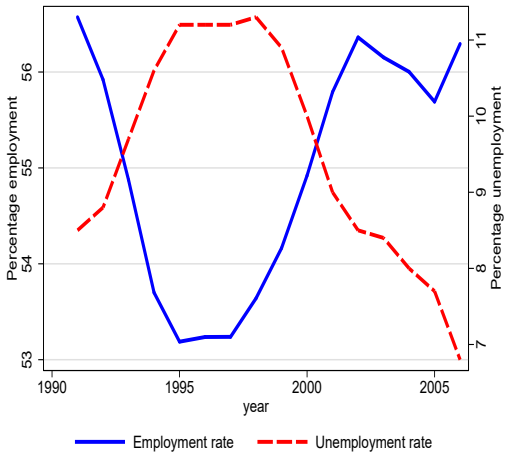
[15]The number of Italian provinces in 1992 was 95: we grouped the provinces of Bergamo with Como and of Nuoro with Sassari due to the limited sample size in SIT; we lose 7 other provinces (Arezzo, Aosta, Belluno, Isernia, Parma, Rieti and Trieste) because of missing information in some SIT waves; finally we lose two provinces (Caltanisetta and Enna) because of missing data on the number of foreign firms.

[16]As discussed in Montanjees (2004) and International Monetary Fund (2004) "private, non-business housing investment (e.g. holiday and other residences owned by nonresidents for personal use...) is, in principle, included

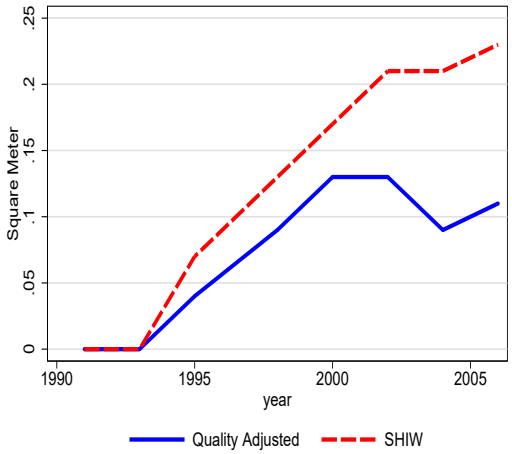
Figure 3: The Italian economy in the 90's and 00's



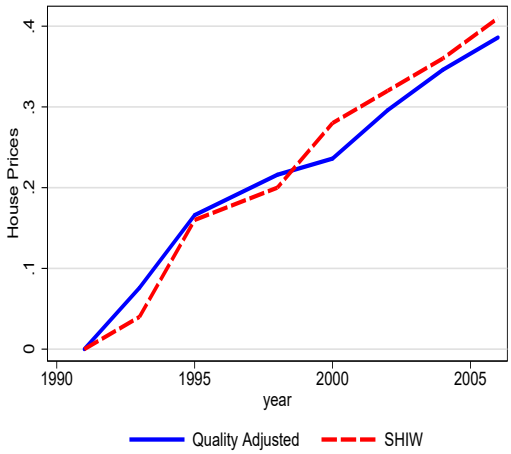
(a) GDP and consumption c



(b) Unemployment and employment e



(c) Consumption of housing services h



(d) Housing price p

purge the measure of foreign assets of country s at t F_{st} by controlling for a full set of World-time dummies, which remove any aggregate shock affecting Italy together with all the other countries. We use the start-of-period value of assets in EWN as a normalization constant and divide by the country's population (from PWT) to obtain per capita foreign assets $f_{st} = \frac{F_{st}}{N_s}$.[17] Both the variation of foreign assets across countries and the variation of foreign assets within a country over time matter for the foreign demand instrument $\overline{b}_{qt}$. The resulting average value of $\overline{b}_{qt}$ is equal to 131 US dollars.

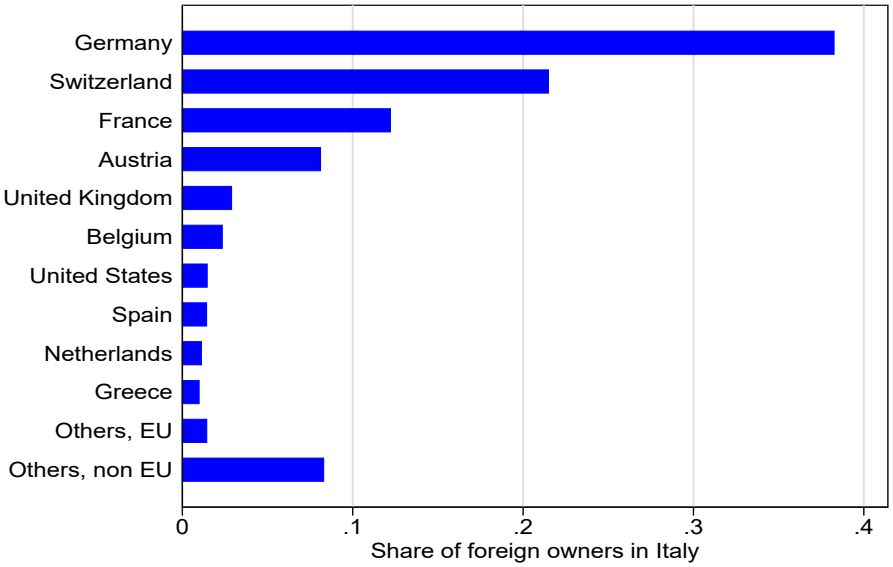
Figure 4 shows the share of foreign housing owned by the various nationalities. Germany, Switzerland, France and Austria account for nearly 70 percent of all foreign-owned Italian hous-

in direct investment" (Paragraph 382).

[17]We think of an Italian province q as a small open economy which is unlikely to affect the amount of total assets invested internationally by country s: the Italian economy is small relative to the world economy (less than 5 per cent of world GDP in 2000) and an Italian province is small relative to the aggregate economy (on average 1.1 percent of Italian GDP).

ing. Germany and the United Kingdom are examples of important non-neighboring countries with substantial shares. The list of foreign nationalities owning houses in Italy is long and varied: non-EU countries (even excluding the US) account for almost 10 percent of all foreign-owned housing in Italy.

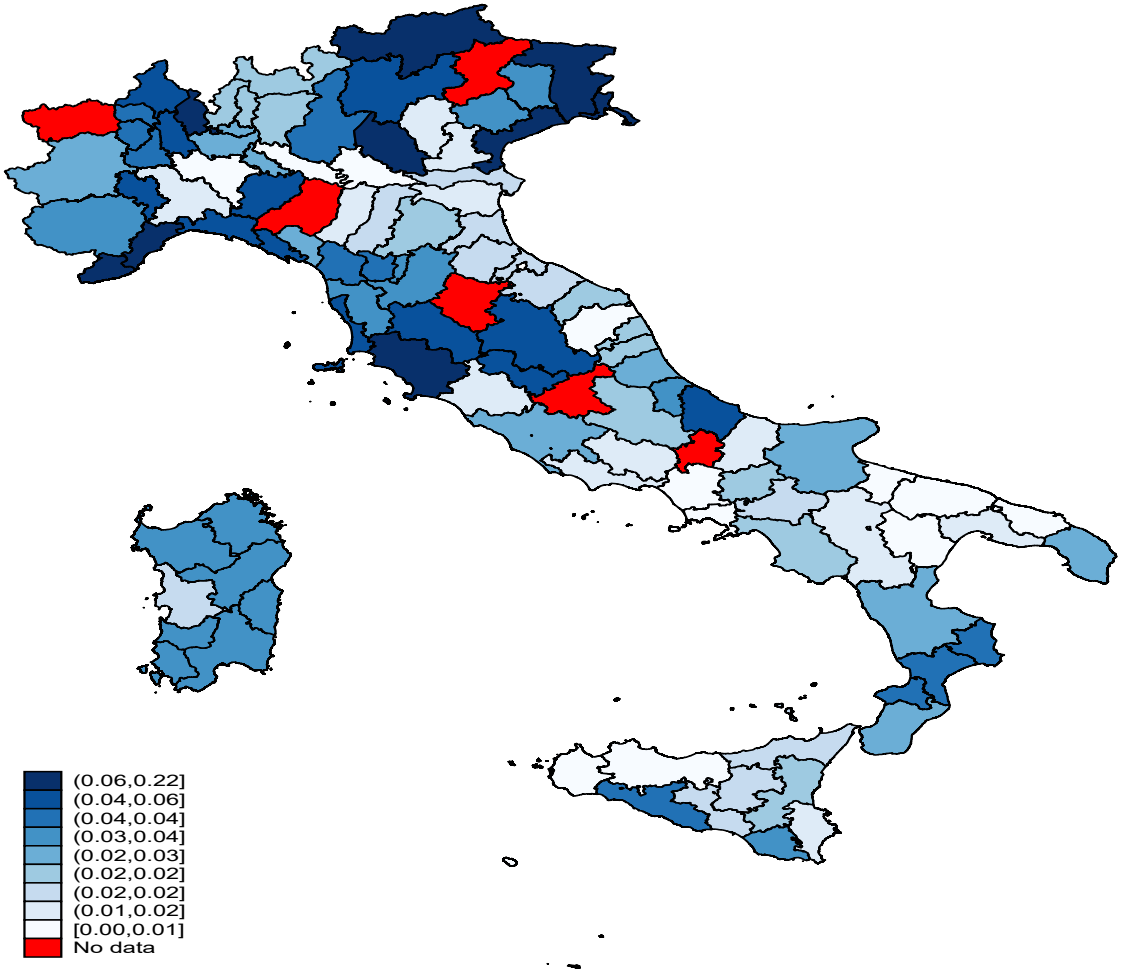
Figure 4: Share of foreign owners by nationality



The importance of foreign ownership in the housing market of province q is measured by ϕ_q in (42). Its average value across provinces is around 3 percent, but there is substantial variation in ϕ_q across provinces. In some provinces foreign owners account for more than 20 percent of the entire local housing market, while at the bottom ventile of the cross distribution of ϕ_q foreign owners account for just 1 percent of the market. Figure 5 illustrates how ϕ_q varies across Italian provinces. The values of ϕ_q's are divided into nine groups of equal size. A darker blue indicates a greater value of ϕ_q. Interestingly, there are quite large differences in the relative importance of foreigners in the housing market even between neighboring provinces.

The three determinants of welfare are (i) (total or nondurable) consumption expenditures in goods or services (excluding housing) c_{qt} obtained directly from SHIW, (ii) employment e_{qt} from LFS, and (iii) housing services enjoyed by local resident households h_{qt}. Annual consumption expenditure per capita is around 5,000 1990 Euros, which corresponds to around 15,000 Euros per household. The average employment rate is 55 percent. Since housing is highly differentiated, h_{qt} is calculated using detailed household level information from SHIW. First we impute a (constant) value to the housing services provided by each square meter of housing space, by location (central, suburban, etc.), by type (housing project, high end, etc.) and by age. We sum these values for each household and (owing to the presence of outliers) calculate the median by province and year (see Appendix O2 for details on the measurement of housing services). Panel (c) of Figure 3 plots the average provincial value of our quality-adjusted measure of consumption of housing services in square meters h_{qt} and compares it with a raw unadjusted measure based on the average number of square meters used by Italian households in SHIW: the two series have

Figure 5: Importance of foreign owners in the local housing market by province, ϕ_q



a similar time profile, albeit with somewhat less variation in the quality-adjusted measure.

Housing prices are quality-adjusted using the detailed household level information in SHIW. We regress the yearly self-reported rents in SHIW (imputed for house owners) on their size (in squared meters), location (central, suburban, etc.), type (housing project, high end, etc.), age and a full set of province-year fixed effects. We take the province-year fixed effects as a measure of the quality-adjusted housing price in the province and year, as in Albouy, Ehrlich, and Liu (2015). Panel (d) of Figure 3 plots our quality-adjusted housing price averaged across provinces and compares its profile with unadjusted measures of real housing prices (deflated by the CPI) from SHIW. The two series exhibit similar trends over the entire period, but our quality adjusted measure fluctuates less. We reach the same conclusions when comparing our quality-adjusted measure with real housing prices from EUROSTAT or OECD. This reflects the fact that we control for the changing composition of houses for sale or rent, that the data in SHIW are at a lower frequency and most importantly that the self-reported rents in SHIW are largely unaffected by high-frequency, temporary fluctuations in housing prices, which is convenient for identifying long-run steady-state elasticities.

3.3 Historical and cultural accidents

Different nationalities value the same province differently: the value of $\sigma_{qs} = o_{qs}/O_s$ varies across s for given q. The thesis here is that these cross-country differences in preferences are driven in significant part by random historical events—arguably exogenous to the evolution of consumption, housing services, and employment in our sample—that first establish a connection between a province q and a country s, which then persists and grows over time due to network externalities. These events may be due to migration flows: four out of the top ten most relevant provinces for Belgian home owners, for instance, are in Sicily, which likely reflects the massive emigration of Sicilians, in the 1930s and 1940s, to work as miners in Belgium. Some locations also become popular among foreign nationalities because of cultural accident: the city of Padua is particularly prominent among Portuguese housing owners (the fourth-leading province among the Portuguese) because the city's patron saint, "St. Anthony of Padua", was born in Lisbon, where he is actually known as "St. Anthony of Lisbon"; the town of Garda (province of Verona), on Lake Garda, is the second most important town for German house owners (despite a resident population of just 4,000), presumably thanks to Goethe, who praised the location effusively in his "Italian Journey"; similarly, San Candido (province of Bolzano) is a prominent location among Hungarian house owners since the well-known Hungarian doctor Johann Graf Scheibler purchased the public baths from a monastery in 1854 and refurbished them to open the then famous "Grand Hotel Wildbad".

Wars too have helped to shape the current preferences of foreign nationalities. Ever since the fall of the Western Roman Empire in 476 CE, Italy has been subject to a series of foreign invasions. The most recent came in World War II, by both the Axis and the Allied troops. The high incidence of Brazilian home owners in the province of Pistoia, for instance, can be traced to the stationing of Brazilian troops (FEB, Força Expedicionaria Brasileira) during WWII, who were long deployed close to the Gothic line: today a Brazilian war cemetery and a Tomb of the Unknown Soldier still commemorate the contribution of Brazilians to the liberation of Pistoia. More generally, the movements of Allied and Nazi troops during WWII provide an ideal experiment in the way historical accidents have shaped the geographical preferences of foreigners today. After entering WWII as a member of the Axis (with Germany and Japan), Italy surrendered to the Allied troops in September 1943, and Germany then occupied the entire Italian territory. Italy was eventually liberated by the Allied troops in the spring of 1945, after a lengthy campaign that started with landings in Sicily in July 1943 and progressed slowly through the entire peninsula. Importantly, the US, British, and Canadian forces followed clearly distinct routes through Italy, partly as a consequence of the personal antagonism between US General George Patton and British Field Marshal Bernard Montgomery (Atkinson 2013).[18] In Sicily, after landing in the southeastern part of the island, the US troops gained control of the

[18]The Allied forces consisted of the US 7$^{\text{th}}$ Army present in Sicily in 1943; the US 5$^{\text{th}}$ Army present in central and northern Italy in 1944 and 1945; the British 8$^{\text{th}}$ Army present for the entire Italian campaign; and the Canadian 1$^{\text{st}}$ Army, which tended to gravitate close to the British Army and was redeployed to the northern European front in February 1945. Both the American and British armies were composed of soldiers of different nationalities: the 5$^{\text{th}}$ Army included Brazilian and French soldiers; the British 8$^{\text{th}}$ Army, New Zealanders. Figure O1 plots the detailed movements of Allied troops through the entire Italian campaign.

western provinces (Palermo, Trapani, Caltanissetta), the British of the eastern provinces (Enna, Catania, Siracusa). The two armies joined up again in Messina, but the British were then exclusively responsible for liberating the southernmost part of Italy. After the US Army landed near Salerno, south of Naples, the Americans and British split again: the US army moved north up the western coast, while the British took the eastern coast.

Nazi troops too were in Italy, of course, but their presence is commonly associated with episodes of extreme violence (Fontana, Nannicini, and Tabellini 2018)), which generated hostility of locals against Germans and likely made certain provinces unattractive to Germans today.[19] Therefore, we build on Cannella, Makarin, and Pique (2021) and focus on Nazi Operational Zones: areas designated for future annexation to the Reich, where Germans were relocated as permanent residents, local political leaders were replaced by Germans, and the German and Italian languages were treated equally. There were two main Operational Zones: the Alpine Foothills, with the provinces of Belluno, Trento and Bolzano; and the Adriatic Littoral, with Gorizia, Pordenone, Udine and Trieste (see Figure O1). We compiled a full list of provinces exposed to the presence of US, British, Canadian or German troops during WWII, via Allied military operations or Nazi Operational Zones. With a few exceptions, all Italian provinces were exposed to one of the four militaries, but the exposition varies across nationalities.[20] To study how the WWII experience of national troops shaped the relative preference of nationality s for province q, as measured by the (log of) $\sigma_{qs} = o_{qs}/O_s$, we restrict the sample to $s \in \{\text{US, UK, Canada, Germany}\}$ and run the regression

$$\ln(\sigma_{qs}) = \sum_{n \in \{\text{US, UK, Can., Ger.}\}} \alpha_{1n} \times \text{MilitaryExposure}_{qs}^{n} + \tau_q + \varepsilon_{qs}$$

where $\text{MilitaryExposure}_{qs}^{n}$ is a dummy variable equal to one only if province q was exposed to troops of nationality $n \in \{\text{US, UK, Canada, Germany}\}$ and $s = n$. The τ_q's are a full set of province fixed effects that control for the general attractiveness of provinces. Table 2 reports the estimates for α_{1n}'s. In column 1, the α_{1n}'s are restricted to be equal across nationalities n, in column 2 they are allowed to differ. Column 1 indicates that, on average, the preference for a province q by a nationality increases by 37% if the military troops of that nationality conserve good wartime memories of the province. Column (2) shows that the effect is positive and significant for all nationalities, with a particularly strong effect for Canadians and Germans.

[19] Moreover, during the Italian campaign Germans were in the losing side and on retreat, so the presence of Nazi troops is likely to have shaped the preferences of present-day Germans very differently from the presence of Allied troops for British, Americans or Canadians.

[20] Some provinces were multiply exposed: for example the US, UK, and Canadian troops all fought close to Florence; the province of Trento liberated by the US Army was also part of the Alpine Foothill Operational Zone.

Table 2: Preferences for Italian housing and WWII military operations

	(1)	(2)
Presence of own national troops or operational zones	0.37***	
	(0.10)	
Presence of UK troops for UK		0.27*
		(0.14)
Presence of US troops for US		0.20*
		(0.12)
Presence of CA troops for CA		0.95***
		(0.27)
Presence of operational zone for DE		1.53***
		(0.34)
Observations	389	389
R-squared	0.68	0.70

Notes: The dependent variable is $\ln \sigma_{qs}$. The regressions contain province fixed effects and include only the following countries s: US, UK, Canada, and Germany. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

3.4 Further discussion

Here we discuss further issues related to the empirical strategy.

Evidence on the channel According to the model mechanism of Section 2, an increase in housing prices can stimulate the economy by expanding the financial capacity of firms, which can borrow more and therefore increase labor demand and wages. We check for these effects in the data by running a regression similar to (34) where the dependent variable is either wages or per-capita firm debt (both in log). Another implication of the collateral channel is that housing prices have an effect on the economy even after controlling for household wealth b: housing differs from other components of wealth having collateral value. We test for this model prediction by checking that results are robust to controlling for household wealth.

Correlated shocks Shocks common to province q and its foreign partners could represent a threat to the identification strategy: some common shocks could simultaneously affect foreign countries (hence the instrument $\overline{b}_{qt}$) as well as province q, generating a spurious correlation in the estimation of (34), (35) and (37). We address this concern in two ways. First, we show that controlling for province specific aggregate shocks (possibly correlated with shocks to foreign partners) the results change very little: we allow the regression time dummies in (34)-(37) to vary by province d_{qt}, using the interactive fixed effects factor model of Bai (2009).[21] As an alternative, we construct productivity measures for the trading partners of province q,

[21] Bai (2009) shows that the interactive fixed effects estimator achieves consistency in the presence of province specific aggregate shocks, see Hagedorn, Karahan, Manovskii, and Mitman (2019) for a recent application of the methodology.

separately for the countries to which province q exports goods (and services) and for those from which it imports goods. To construct the productivity measures, we combine the country-sector level information in the STAN OECD database with the uniquely detailed trade flow data for Italian provinces, collected by the Italian Customs Agency and made available by ISTAT at `https://www.coeweb.istat`. For each sector z and province q, ISTAT provides the value of all exports and imports to any specific foreign country s. We denote by ℓ_{szt} the labour productivity in sector z of country s in year t from STAN. The productivity of the trading partners of province q at t, S^K_{qt}, in terms of exports when $K = X$ or imports when $K = M$ is equal to the average productivity of all the province's trading partners, weighted by either the exports or the imports of the province:

$$S^K_{qt} = \frac{\sum_{s,z} K^{93-95}_{qsz} \cdot \ell_{szt}}{K^{93-95}_{q}}, \quad \forall K = X, M \tag{43}$$

In (43), X^{93-95}_{qsz} (M^{93-95}_{qsz}) denotes the value of all goods exported (imported) by province q to (from) country s in sector z over the years 1993-1995, divided by the provincial population. X^{93-95}_{q} (M^{93-95}_{q}) is the value of all goods exported (imported) by province q over the same period. The early years of the samples are used to calculate export and import weights in order to minimize the risk of reverse causality. The controls for the productivity of export partners $\widehat{S}^X_{qt}$ and import partners $\widehat{S}^M_{qt}$ are obtained by adjusting for the importance of exports and imports in province q as follows

$$\widehat{S}^K_{qt} = \chi^K_q \cdot S^K_{qt} \tag{44}$$

where χ^K_q measures the importance of exports, $K = X$, or imports, $K = M$, for province q by taking the ratio between the average per capita exports or imports of province q and its standard deviation over the entire sample period. By controlling for $\widehat{S}^X_{qt}$ and $\widehat{S}^M_{qt}$ in the regressions (34), (35), and (37), we rule out the possibility that foreign demand $\overline{b}_{qt}$ drives the results simply because the foreign partners grow or decline.

FDI, tourism, construction, and trade We interpret the evidence by relying on the collateral channel as in Chaney, Sraer, and Thesmar (2012), but the sufficient statistic for welfare in (39) and the implied welfare conclusions do not depend on the particular channel through which the welfare results are derived. Other channels are indeed possible. It could be that the increase in foreign demand $\overline{b}_{qt}$ masks an increase in (i) foreign direct investment in the province with an associated increase in foreign business activity, (ii) tourism, (iii) construction, or (iv) foreign trade driven by local foreign demand.[22] We investigate the relevance of these four alternatives, and conclude that they are unlikely to account for the full story. In all specifications we control for the number of foreign firms in the province, the share of tourism in total employment and the analogous share of construction (all in logs), which represents a first attempt to control for (i)-(iii). To better account for (i), we also check that the results are robust to controlling for the log share of foreign white collar employees in total employment in the province (FDI being typically associated with a greater incidence of foreigners in management positions) and that

[22]See Faber and Gaubert (2019) for evidence about the positive spill-overs of tourism on overall economic activity.

the results change little when foreign housing demand is calculated net of foreign owners who visit Italy for business, as declared in SIT. To better account for (ii) we show that the results stand after controlling for the expenditures of foreign visitors to the province, data directly collected by SIT. Controlling for foreign expenditure is also an indirect way of accounting for the trade channel in (iv). To better account for (iv), we further verify that the results are robust to controlling for provincial trade imbalances (or trade volumes) as measured for example by the log of the ratio of total exports to total imports.

Measurement issues There are some measurement issues, which are addressed mainly in Appendix O3. SIT interviews foreigners at all ports of entry, so nationalities who visit Italy more frequently might be over-counted in the computation of the number of foreign owners in a province, i.e. in the value of o_{qs}. Accordingly, we weight housing owners of different nationality by (the inverse of) the frequency of their visits to Italy. Another measurement issue is that foreign-owned housing involves a transfer of wealth from foreigners to local households only at the time of the purchase, so the foreign assets F_{st} used to construct the foreign demand instrument $\overline{b}_{qt}$ in (40) should be at book value. Since in EWN, some countries report assets at book value and others at market value, we check that the results remain largely unchanged when $\overline{b}_{qt}$ is constructed using only those reporting at book value. Finally, we checked that results are robust to using total assets rather than FDI alone to construct the foreign demand instrument; when we exclude provinces with a population greater than 2 million (Rome, Milan, Naples and Turin); when we allow the elasticity of housing prices to foreign demand to vary across sub-periods (1993-1998, 2000-2002, and 2004-2006); and when housing prices are not quality-adjusted—as expected, in this last case, the statistical significance of the estimates declines somewhat.

4 Empirical results

We report the results from the first stage regression for housing prices in (35), the two-stage least squares regression for employment and housing services in (34), and the reduced form regression for consumption in (37). Then we discuss the results for wages and firm debt. We conclude with an analysis of the welfare implications as measured by the statistic $\hat{H}$ in (39).

4.1 First stage

Table 3 reports the estimates from the regression of the quality-adjusted measure of housing prices (in log) on log foreign housing demand $\ln \overline{b}_{qt}$ multiplied by its relative importance in the province ϕ_q, where $\overline{b}_{qt}$ and ϕ_q are equal to (40) and (42), respectively. In the baseline specification (column 1) we control for a full set of province and time dummies, the number of foreign firms in the province, and the shares of employment in the construction and tourist industry (all in log). In the remaining columns we separately add controls to the baseline specification. Column (2) adds the (sector-level) productivity of all countries to which the province exports goods (or services) $\widehat{S}^X_{qt}$ and that of all countries from which province q imports goods $\widehat{S}^M_{qt}$. Column (3) adds the interactive fixed effects factor as in Bai (2009) to control for correlated shocks. Column (4)

Table 3: First stage

	(1) Baseline	(2) Correlated shocks	(3) Interactive factor	(4) Tourist expend.	(5) Trade	(6) Tourist weights	(7) Wealth
Foreign demand, $\phi \cdot ln(\overline{b})$	0.57***	0.60***	0.61***	0.53***	0.51***	0.53***	0.58***
	(0.17)	(0.16)	(0.18)	(0.17)	(0.17)	(0.16)	(0.17)
ln(Tourism empl.)	0.04	0.03	0.03	0.03	0.04	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln(Construction empl.)	0.11**	0.10**	0.11**	0.11**	0.11**	0.11**	0.11**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
No. of foreign firms	0.00*	0.00	0.00*	0.00	0.00	0.00*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Partners product., exp.		-0.04**					
		(0.02)					
Partners product., imp.		0.04**					
		(0.02)					
Bai-interactive factor			0.30				
			(0.31)				
ln(Tourist expenditure)				0.00			
				(0.01)			
ln(Exports/Imports)					-0.05		
					(0.03)		
ln(Household wealth)							0.12***
							(0.03)
Observations	588	588	588	578	588	588	588
Number of provinces	84	84	84	84	84	84	84
$\varkappa$	.02	.02	.02	.02	.02	.02	.02
F stat	11.93	14.55	11.97	9.351	8.596	10.34	11.95

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. The dependent variable is the log quality-adjusted housing price. Foreign housing demand in province q is equal to $\phi \ln \overline{b}$ with $\overline{b}$ and ϕ given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects. Column (2) controls for the (sector-level) productivity of all countries to which province q exports goods (or services) and the productivity of all countries from which province q imports goods; column (3) controls for interactive fixed effects as in Bai (2009); column (4) for the expenditure by foreign visitors; column (5) for the province-level trade imbalance (log exports divided by imports); and column (7) for median household wealth. In column (6) we calculate foreign housing demand net of foreigners who visit Italy for business purposes. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

also includes the expenditure of foreign visitors. Column (5) controls for the province-level trade imbalance as measured by the log ratio between exports and imports. In column (6), we run the baseline specification when foreign housing demand $\overline{b}_{qt}$ is constructed net of foreign owners who visit Italy for business purposes. Column (7) controls for median household wealth in the province. In all specifications the foreign demand instrument $\phi_q \ln \overline{b}_{qt}$ is highly significant, as is confirmed by the high values of the F-statistic. The coefficient of log housing prices to $\phi_q \ln \overline{b}_{qt}$ ranges from 0.5 to 0.7. After accounting for the average importance of foreign demand in the housing market (around 3%), the elasticity of housing prices to foreign demand $\overline{b}_{qt}$, corresponding to $\hat{\varkappa}$ in (36), is equal to 2% and quite stable across specifications (see bottom of Table 3). Across specifications, the employment share of tourism in the province and the number of foreign firms are scarcely significant, while the share of employment in construction is positively correlated

with housing prices. Table O1 in the Appendix shows that the results change very little when the weights used to construct foreign demand in (40) are adjusted to reflect the frequency with which foreign owners visit Italy, when we drop the provinces with over 2 million population (Rome, Milan, Naples and Turin), when we exclude from the foreign demand instrument the countries that report FDI at market value such as France and Norway (Lane and Milesi-Ferretti, 2001, 2007), when total rather than FDI assets are used to construct the foreign demand instrument, or when we compare different sub-samples over time.

4.2 Employment, housing services, and consumption

Tables 4 and 5 report the two-stage least squares estimates corresponding to the regression in (34). Housing prices are instrumented with foreign demand $\phi_q \ln \overline{b}_{qt}$. Table 4 shows per capita

Table 4: Employment

	(1) Baseline	(2) Correlated shocks	(3) Interactive factor	(4) Tourist expend.	(5) Trade	(6) Tourist weights	(7) Wealth
ln(Price)	0.25**	0.24**	0.46***	0.26**	0.28**	0.25**	0.24**
	(0.11)	(0.10)	(0.15)	(0.12)	(0.13)	(0.12)	(0.11)
ln(Tourism empl.)	0.01	0.01*	-0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ln(Construction empl.)	0.01	0.01	-0.01	0.00	0.01	0.01	0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
No. of foreign firms	0.00	0.00	-0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Partners product., exp.		0.01					
		(0.01)					
Partners product., imp.		-0.01					
		(0.01)					
Bai-interactive factor			0.86***				
			(0.14)				
ln(Tourist expenditure)				-0.00			
				(0.00)			
ln(Exports/Imports)					0.02		
					(0.01)		
ln(Household wealth)							-0.02
							(0.02)
Observations	588	588	588	578	588	588	588
Number of provinces	84	84	84	84	84	84	84

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. The dependent variable is (log) employment in the province. Housing prices are instrumented with foreign demand $\phi \ln \overline{b}$. All regressions include a full set of province and year fixed effects. Column (2) controls for the (sector-level) productivity of all countries from which province q imports goods (or services) as well as the productivity of all countries to which province q exports goods; column (3) controls for interactive fixed effects as in Bai (2009); column (4) for the direct expenditure by foreign visitors; column (5) for the province-level trade imbalance (log exports divided by imports); and column (7) for median household wealth. In column (6) we calculate foreign housing demand net of foreigners who visit Italy for business purposes. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

employment e_{qt}, Table 5 consumption of housing services by locals h_{qt} (both in log). The tables are structured exactly like Table 3: column (1) is the baseline specification; column (2) adds as a control the productivity of the province's trading partners; column (3) reports the results for the interactive fixed effects factor as in Bai (2009); column (4) controls for the direct expenditure of foreign visitors; column (5) controls also for the province-level trade imbalance; column (6) is the baseline regression where foreign housing demand is net of foreigners who visit Italy for business purposes; and column (7) adds median household wealth. The estimates indicate an elasticity of employment to housing prices, η_e in the range 0.2–0.45. As expected, the demand for housing services by local households is negatively related to housing prices, with an elasticity η_h in the range from -1.5 to -0.5, consistent with an elasticity of substitution close to 1 for housing demand, as is commonly found in the literature (Piazzesi et al. 2007, Davis and Ortalo-Magné 2011 and Berger et al. 2017). These results are confirmed by the robustness checks reported in the appendix, see Tables O2 and O3.

Table 5: Housing services

	(1) Baseline	(2) Correlated shocks	(3) Interactive factor	(4) Tourist expend.	(5) Trade	(6) Tourist weights	(7) Wealth
ln(Price)	-0.62**	-0.58**	-1.42***	-0.64**	-0.68**	-0.59**	-0.60***
	(0.26)	(0.25)	(0.46)	(0.31)	(0.30)	(0.27)	(0.21)
ln(Tourism empl.)	0.04	0.03	0.06	0.03	0.04	0.04	0.02
	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Construction empl.)	0.07	0.05	0.19**	0.07	0.07	0.07	0.07
	(0.05)	(0.05)	(0.09)	(0.06)	(0.06)	(0.05)	(0.04)
No. of foreign firms	0.00	0.00	0.00	0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Partners product., exp.		-0.03					
		(0.02)					
Partners product., imp.		0.04*					
		(0.02)					
Bai-interactive factor			1.32***				
			(0.22)				
ln(Tourist expenditure)				0.01			
				(0.01)			
ln(Exports/Imports)					-0.02		
					(0.03)		
ln(Household wealth)							0.25***
							(0.03)
Observations	588	588	588	578	588	588	588
Number of provinces	84	84	84	84	84	84	84

Notes: The dependent variable is (log) median consumption of housing services in the province. See the legend to Table 4 for further information.

Table 6 shows the reduced form results of the regression of (log) per capita consumption on $\phi_q \ln \overline{b}_{qt}$ as in (37). Each column corresponds to a different specification, ordered exactly as in

Tables 3-5. The coefficient on $\phi \ln(\overline{b})$ is positive and statistically significant, with values in the range 0.77–0.9. The robustness checks in the Appendix (see Table O4) show that the responses of total consumption and non-durable goods consumption are similar.

Table 6: Consumption (reduced form)

	(1) Baseline	(2) Correlated shocks	(3) Interactive factor	(4) Tourist expend.	(5) Trade	(6) Tourist weights	(7) Wealth
Foreign demand, $\phi \cdot ln(\overline{b})$	0.77**	0.78***	0.85***	0.83***	0.79**	0.83***	0.77***
	(0.31)	(0.29)	(0.24)	(0.31)	(0.31)	(0.27)	(0.29)
ln(Tourism empl.)	0.06**	0.05**	0.02	0.06***	0.06**	0.06**	0.05**
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Construction empl.)	0.08*	0.07*	0.05	0.09**	0.08*	0.08*	0.08*
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
No. of foreign firms	0.00	0.00	0.00***	0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Partners product., exp.		-0.02*					
		(0.01)					
Partners product., imp.		0.02					
		(0.02)					
ln(Tourist expenditure)				0.02			
				(0.01)			
ln(Exports/Imports)					0.02		
					(0.02)		
ln(Household wealth)							0.13***
							(0.03)
Observations	588	588	588	578	588	588	588
R-squared	0.39	0.39	0.92	0.39	0.39	0.39	0.42
Number of provinces	84	84		84	84	84	84
Implied elast.	1.14	1.11	1.2	1.34	1.33	1.35	1.14
F stat	25.99	25.49		25.25	24	27.93	26.62

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. The dependent variable is (log) per capita total consumption in the province. Foreign housing demand in province q is $\phi \ln \overline{b}$ with $\overline{b}$ and ϕ given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects. Column (2) also controls for the (sector-level) productivity of all countries from which province q imports goods and the productivity of all countries to which province q exports goods; column (3) also controls for interactive fixed effects as in Bai (2009); in column (4) for the direct expenditure of foreign visitors; column (5) for the province-level trade imbalance (log exports divided by imports); and column (7) for median household wealth. In column (6) we calculate foreign housing demand net of foreigners who visit Italy for business purposes. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

The results in column (7) of Tables 4-6 indicate that housing prices have an impact on the local economy even after controlling for household wealth b, consistent with the model in Section 2, which posits that housing is different from other wealth components because of its value as collateral. Another implication of that model is that an increase in housing prices stimulates the economy by expanding firms' financial capacity, and so indirectly increasing labor demand and wages. We check for these effects in the data by running the two-stage least squares regression

in (34) using as a dependent variable either hourly wages or per-capita firm debt (both in log). Table 13 reports the resulting estimates for the elasticity of wages to housing prices (column 1) and for the elasticity of firm debt to housing prices (column 2). The full set of robustness checks discussed above are reported in Tables O5-O8 in the Appendix. Wages rise in response to an increase in housing prices with an elasticity in the range 0.45–0.5. Firm debt also increases, with an estimated elasticity slightly greater than 1.

Table 7: Wages and firm debt

	(1)	(2)
	Wages	Firm debt
ln(Price)	0.45**	1.13*
	(0.22)	(0.65)
ln(Tourism empl.)	0.01	-0.01
	(0.02)	(0.05)
ln(Construction empl.)	-0.03	-0.01
	(0.04)	(0.11)
No. of foreign firms	-0.00	0.00
	(0.00)	(0.00)
Observations	588	588
Number of provinces	84	84

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. The dependent variable is (log) average monthly wage in the province in column (1) and (log) average per capita firm debt to banks in the province in column (2). Housing prices are instrumented with foreign housing demand $\phi \ln \bar{b}$. All regressions include a full set of province and year fixed effects, the log share of tourism employment, the log share of construction employment, and the number of foreign firms. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

4.3 Welfare implications

Let us now proceed to discuss the welfare implications of the estimates set out in Tables 3-6. We calculate the implied value of H in (39), which measures the percentage increase in consumption equivalent to an (exogenous) increase in housing prices. We take the baseline specification in column 1 of Tables 3-6 as a benchmark. The resulting elasticities are reported in the first row of Table 8. We also calculate the lowest and the highest H implied by the estimates: the lowest is attained with the lowest consumption elasticity in (38) η_c and the highest estimates (in absolute value) for the employment elasticity η_e and the housing demand elasticity η_h (see second row of Table 8); the highest value of H is attained with the highest η_c and the lowest η_h and η_e (see third row). To calculate H in (39), we need to impute a value to the contribution of housing services to household utility μ_h, to the analogous contribution of leisure μ_e, and to the capital income obtained by local households out of the foreign wealth invested in Italian housing, $r\bar{b}/c$.

To evaluate μ_h in (19), we use the 1993 SHIW and calculate the ratio between the sum of all (imputed or effective) housing rents of Italian households, equal to 2,962 Euros per year in 1993,

and their total consumption expenditure (excluding housing expenditure) equal to 15022 Euros in 1993. The implied share of housing services is $\mu_h = 0.1975$.[23] To calculate μ_e in (18), we take the ratio between the Italian labor share in 1993, equal to 60%, and the share of consumption in GDP in 1993, namely 69% (both from PWT), which implies $\mu_e = 0.8696$.[24] We assume a real annual return on capital of 2 percent, $r = .02$ and use (19) to impute $\bar{b}/c$ as follows

$$\frac{\bar{b}}{c} = \frac{\phi}{1-\phi} \times \frac{\mu_h}{r},$$

where ϕ is the share of foreign owners in the Italian housing market. Given $r = .02$ and $\phi = 0.03$, the above expression implies that foreign wealth invested in Italian housing amounts to about 30 percent of Italy's annual consumption expenditure, $\bar{b}/c = 0.3054$. Substituting this into (38), under the baseline specification, we obtain a consumption elasticity η_c of 1.04. Using (39), we conclude that under the baseline specification a 1-percent rise in housing prices implies a 0.71 percent increase in consumption equivalent (see Table 8), which would imply inefficiently low housing prices according to Proposition 2. Taking the most unfavorable estimates for H, the increase in welfare falls to 0.26 percent but remains positive. Taking the most favorable estimate, we get a value close to 1 percent.

Table 8: Welfare statistic

Model specification	**Elasticity of**			
	Consumption, η_c	Housing, η_h	Employment, η_e	Welfare, H
Baseline	1.08	-0.62	0.25	0.74
Minimum welfare	0.94	-1.42	0.46	0.26
Maximum welfare	1.27	-0.51	0.21	0.99

Notes: In the calculations, the annual return on assets, r is 0.02, the ratio of foreign housing wealth to total consumption, $\bar{b}/c$ is 0.3054, the net labor share, μ_e, is 0.8696, and the share of housing services in consumption, μ_h, is 0.1975.

5 Extensions and robustness

We can build on Section 2.2 to extend the empirical analysis, allowing for preferences with income effects, spill-overs across provinces, lagged effects of prices on equilibrium outcomes (employment, housing demand, and consumption) and cross-sectional heterogeneity across households. In

[23] This value is in line with the US evidence. According to BEA (`https://fas.org/sgp/crs/misc/IF11327.pdf`), US spending on housing services amounted to 12% of GDP in 1993 and the share of consumption expenditures in GDP was 62%, implying a value of μ_h of 0.1935.

[24] The labor share corresponds to the mnemonic "labsh". The share of consumption in GDP is the ratio of the mnemonics "ccon" to "rgdpo".

evaluating the statitics, we use the same weights as above for leisure and housing services in the utility function, μ_e and μ_h, and the same capital income from foreign assets $r\bar{b}/c$.

5.1 Income effects

With income effects the equilibrium housing price is a function of both foreign demand $\bar{b}$ and consumption c (see (53)). As a result we now control also for consumption, $\ln c$, in the first stage regression in (35) and the two-stage least squares regressions in (34). Table 9 reports the two-stage least squares estimates for the elasticity of employment $\hat{\eta}_e$ (column 1) and housing services $\hat{\eta}_h$ (column 2) after adjusting for income effects in the baseline specification. The full set of robustness checks previously discussed are reported in Tables O10 and O11 in the Appendix. The results for the first stage regressions, after controlling for consumption, are reported in Table O9 in the Appendix. The reduced form regression for consumption remains unchanged relative to Table 6, with an implied consumption elasticity η_c of 1.04. Controlling for consumption, the elasticities of employment $\hat{\eta}_e$ and housing services $\hat{\eta}_h$ both increases in absolute value, from 0.25 in Table 4 to 0.39 in Table 9 and from -0.62 in Table 5 to -1.28 in Table 9, respectively.

Table 9: Income effects

	(1) Employment	(2) Housing
ln(Price)	0.39*	-1.28*
	(0.23)	(0.67)
ln(Consumption)	-0.10	0.49**
	(0.08)	(0.23)
Observations	588	588
Number of provinces	84	84

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. The dependent variable is per capita employment in column (1) and per capita consumption of housing services in column (2) (both in log). Housing prices are instrumented with foreign housing demand $\phi \ln \bar{b}$. All regressions include log per capita total consumption, a full set of province and year fixed effects, the log share of tourism employment, the log share of construction employment, and the log number of foreign firms. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

With income effects the welfare statistic for the percentage increase in consumption equivalents is given by H^I in (23) which can be estimated as follows

$$\hat{H}^I = \hat{\mu}_c \hat{\eta}_c + \mu_h \cdot \hat{\eta}_h - \mu_e \cdot \hat{\eta}_e \tag{45}$$

where the weight of consumption in the utility is now given by

$$\hat{\mu}_c = 1 + \mu_h \hat{\lambda}_h - \mu_e \hat{\lambda}_e, \tag{46}$$

where $\hat{\lambda}_h$ and $\hat{\lambda}_e$ denote the coefficient of log consumption in the two-stage least squares regression in (34) for housing services and employment, respectively. Since an increase in household

consumption increases household demand for housing services and leisure, $\hat{\lambda}_h$ is generally positive while $\hat{\lambda}_e$ is negative, see Table 9. As a result $\hat{\mu}_c$ is generally greater than 1 and under the baseline specification is equal to $\mu_c = 1.1837$. The resulting value of $\hat{H}^I$ is reported in the last column of the first row of Table 10: a 1-percent increase in housing prices increases welfare (in consumption equivalent) by 0.69 percent, compared with 0.71 in the baseline specification without income effects (see Table 8). The welfare statistic remains practically unchanged, because the negative contribution to welfare of the larger $\hat{\eta}_e$ and $\hat{\eta}_h$ (in absolute value) is offset by the greater-than-one contribution of consumption, as measured by $\hat{\mu}_c$ in (46).

Table 10: Welfare statistic, extensions

Model specification	**Elasticity of**			
	Consumption, η_c	Housing, η_h	Employment, η_e	Welfare, H
Income effects	1.08	-1.28	0.39	0.69
Spill-overs: Sector distance	0.84	-0.62	0.19	0.55
Spill-overs: Km distance	0.85	-0.62	0.22	0.53
Lagged effects	0.84	-0.40	0.22	0.57

Notes: In the income effects specification, the estimated consumption weight is $\mu_c = 1.1837$. In all calculations the annual return on assets r is 0.02, the ratio of foreign housing wealth to total consumption $\bar{b}/c$ is 0.3054, the net labor share μ_e is 0.8696, and the share of housing services in consumption μ_h is 0.1975.

5.2 Spill-overs across provinces

We now study the welfare effects of allowing for spill-overs across provinces. Let $\mathcal{I}_q^C$ denote the set of provinces "close" to province q and $\mathcal{I}_q^D$ denote "distant" provinces. With spill-overs, housing price and consumption in province q depend on local foreign housing demand as well as on foreign demand in close and distant provinces; see (25) and (26). Equilibrium employment in province q depends on local housing prices as well as on prices in other provinces $e(p_q, \mathbf{p}_{-\mathbf{q}})$. To identify these effects in the employment regression in (34), we include the local housing price $\ln p_{qt}$ as well as the average price in close provinces $\widehat{p}_{qt}^C$ and that in distant provinces $\widehat{p}_{qt}^D$. We instrument housing prices with their foreign demand. The average price for close provinces $K = C$ and distant provinces $K = D$ is equal to

$$\widehat{p}_{qt}^K = \sum_{i \in \mathcal{I}_q^K} \frac{\ln p_{it}}{\left|\mathcal{I}_q^K\right|}$$

where $\left|\mathcal{I}_q^K\right|$ is the number of provinces in the set $\mathcal{I}_q^K$. The regressors $\ln p_{qt}$, $\widehat{p}_{qt}^C$ and $\widehat{p}_{qt}^D$ are instrumented with local foreign demand $\phi_q \ln \bar{b}_{qt}$, foreign demand in close provinces $\widehat{b}_{qt}^C$ and

foreign demand in distant provinces $\widehat{b}_{qt}^{D}$ equal to

$$\widehat{b}_{qt}^{K} = \sum_{i \in \mathcal{I}_q^K} \frac{\phi_i \ln \bar{b}_{it}}{\left|\mathcal{I}_q^K\right|}, \quad K = C, D.$$

In the reduced form regression for consumption in (6) we include local foreign demand $\phi_q \ln \bar{b}_{qt}$ as well as $\widehat{b}_{qt}^{C}$ and $\widehat{b}_{qt}^{D}$. A 1-percent increase in the housing price of a province leads to a welfare increase (in consumption equivalent) equal to H^S in (27) which can be estimated as follows

$$\hat{H}^S = \hat{\eta}_c^S + \mu_h \hat{\eta}_h^S - \mu_e \hat{\eta}_e^S \tag{47}$$

The elasticity of consumption $\hat{\eta}_c^S$ and of employment $\hat{\eta}_e^S$ to housing prices are calculated using (28) and (30) as equal to

$$\eta_k^S = \sum_{j \in \{L,C,D\}} \hat{\eta}_{kp_j}, \quad k = e, c$$

where $\hat{\eta}_{ep_j}$ denotes the two-stage least squares estimates of the elasticity of employment in (34) to local housing prices when $j = L$, to the average prices in close provinces when $j = C$, and to the average price in distant provinces when $j = D$, with the prices instrumented using $\phi_q \ln \bar{b}_{qt}$, $\widehat{b}_{qt}^{C}$ and $\widehat{b}_{qt}^{D}$. $\hat{\eta}_{cp_j}$ is the analogous elasticity of consumption with respect to the price p_j, $\forall j \in \{L, C, D\}$. The elasticities $\hat{\eta}_{cp_j}$'s are obtained using (33) where the vector $\frac{\mathbf{dc}}{\mathbf{db}}$ contains the reduced form elasticity of consumption to foreign demand multiplied by the incidence of foreigners in the Italian housing market $E(\phi_q)$, while the matrix $\frac{\mathbf{dp}}{\mathbf{db}}$ in (32) contains the nine coefficients from the first stage estimates (again multiplied by $E(\phi_q)$) of the effects of foreign demand $\phi_q \ln \bar{b}_{qt}$, $\hat{b}_{qt}^{C}$ and $\hat{b}_{qt}^{D}$ on the prices p_j's, $\forall j \in \{L, C, D\}$.[25] The first stage estimates are reported in Table O12 in the Appendix. In calculating $\hat{H}^S$ in (47) (reported in Table 10), we set the elasticity of housing demand $\hat{\eta}_h^S$ in (47) equal to its estimated value under the baseline specification.

We consider two notions of "distance" between provinces: the first gauges differences in sectoral specialization, the second geographical distance in km. The difference in the sectoral specialization patterns of two provinces is equal to the sum of the absolute differences in sectoral employment shares. Two provinces are "close" in terms of sectoral specialization if this distance is smaller than the median distance in whole set of province-by-province distances in Italy; they are "distant" if it is greater than the median and below the third quartile of the overall distribution. Two provinces are "close" geographically if their centroids are less than 150 km apart, are "distant" if they are between 150 and 300 km apart. Table 11 reports the results for sectoral distance in columns (1) and (2) and for km-distance in columns (3) and (4). Columns (1) and (3) are for employment, columns (2) and (4) for per capita consumption. The associated

[25] The effect of a 1-percent increase in the price in a province q on all other provinces in the set $\mathcal{I}_q$ is equal to the regression coefficient on the average price in the set. This follows from a simple reflection property of networks: if a province q affects $|\mathcal{I}_q|$ other provinces, the province q is also affected by $|\mathcal{I}_q|$ other provinces. So a 1-percent change in the price in a province q has an effect on all provinces in the set, which is equal to the product of the number of provinces in the set $|\mathcal{I}_q|$ times the value of the regression coefficient on the average price divided by $|\mathcal{I}_q|$, which is equal to the regression coefficient.

Table 11: Spill-overs across provinces

	SECTORAL DISTANCE		*GEOGRAPHICAL DISTANCE*	
	(1)	(2)	(3)	(4)
	Employment	Consumption	Employment	Consumption
ln(Price) or $\phi \cdot \ln(\bar{b})$	0.23**	0.75**	0.27*	0.77**
	(0.09)	(0.32)	(0.15)	(0.30)
ln(Price) or $\phi \cdot \ln(\bar{b})$ in close provinces	-0.03***	0.26	-0.03	-0.43
	(0.01)	(0.27)	(0.02)	(0.64)
ln(Price) or $\phi \cdot \ln(\bar{b})$ in distant provinces	-0.00	0.60	-0.02	0.06
	(0.02)	(0.45)	(0.02)	(0.39)
Observations	588	588	588	588
Number of provinces	84	84	84	84
F stat	56.92	22	44.75	23.74

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. In columns (1) and (3), the dependent variable is log per capita employment in the province; in columns (2) and (4) it is log per capita consumption. Local housing prices, and the average housing price in close and distant provinces are instrumented with $\phi \ln \bar{b}$, $\widehat{b}^C_{qt}$ and $\widehat{b}^D_{qt}$. All regressions include a full set of province and year fixed effects, the log share of tourism employment, the log share of construction employment, and the number of foreign firms. In columns (1) and (2), distance is measured as the sum of the absolute differences in sectoral employment shares between the two provinces; in columns (3) and (4) it is geographical distance (in km). Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

welfare implications for sectoral distance are reported in the second row of Table 10, the results for geographical distance are in the third row. Spill-overs on employment are generally negative and there is some evidence of negative spill-overs on consumption when considering geographical distance. When allowing for spill-overs across provinces, the welfare statistic $\hat{H}^S$ falls from 0.71 in the benchmark to around 0.55.

5.3 Lagged effects

In the simple model of Section 2, the economy is always in steady state. In practice shocks may induce some transitional dynamics before the economy settles into a new steady state. To study the importance of these lagged effects, we follow the projection methods literature popularized by Jordà (2005) and re-run the baseline specification using housing prices and foreign demand from the previous wave of SHIW, which in most cases means a lag of two years. Column (1) of Table 12 reports the results for the first stage regression in (35), columns 2 and 3 report the two-stage least squares estimates for the elasticity of employment and housing services to lagged housing prices from the specification in (34), and column (4) shows the reduced form results for consumption in (37) when foreign demand is lagged. The fourth row of Table 10 reports the implied welfare statistic. Overall the effect of lagged price changes is similar to the effect of current price changes, which suggests that the elasticities on impact identify long run equilibrium outcomes. The consumption elasticity falls from 1.04 under the baseline to 0.84 with lagged prices, the housing demand elasticity goes from -0.62 under the baseline to -0.40

under lagged prices, and the employment elasticity slips from 0.25 under the baseline to 0.22 with lagged prices. After combining these elasticities, the percentage increase in welfare H falls from 0.71 under the baseline to 0.57 with lagged prices.

Table 12: Lagged effects

	(1) First stage	(2) Employment	(3) Housing services	(4) Consumption
Lagged ln(Price) or Lagged $\phi \cdot \ln(\bar{b})$	0.93***	0.22***	-0.40*	0.98***
	(0.23)	(0.08)	(0.20)	(0.37)
ln(Tourism empl.)	-0.00	0.02***	0.01	0.06**
	(0.03)	(0.01)	(0.02)	(0.02)
ln(Construction empl.)	0.13***	0.01	0.05	0.08*
	(0.04)	(0.02)	(0.05)	(0.04)
No. of foreign firms	0.00*	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	588	588	588	588
Number of provinces	84	84	84	84

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. In column (1), the dependent variable is the housing price, in column (2) employment per capita, in column (3) housing services, in column (4) per capita total consumption (all in log). Foreign housing demand $\phi \ln \bar{b}$ is lagged to the previous SHIW wave (in most cases two years). It is used as a regressor in column (1) and (4), as an instrument for lagged housing prices (previous SHIW wave) in columns (2) and (3). All regressions include a full set of province and year fixed effects, the log share of tourism employment, the log share of construction employment, and the number of foreign firms. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

5.4 Higher order cross-sectional moments

Households could differ in wealth, labor efficiency or asset portfolios. Aggregate welfare (the sum of all household utilities) thus depends on average consumption, employment, and uses of housing as well as on the cross-sectional dispersion of these variables and their covariances. The exclusion restriction implied by (14) still remains valid, but now changes in housing prices impact aggregate welfare through aggregate means as well as through higher order cross-sectional moments. We now look at the effects of changes in housing prices on the second moments of the cross-sectional distribution of consumption, housing demand and leisure within a province q. In column (1) of Table 13, the dependent variable is the (cross-sectional) standard deviation of the number of months worked in a wave of SHIW; in column (2) it is the standard deviation of per capita total consumption; in column (3) it is the standard deviation of per capita consumption of durable goods; in column (4) it is the standard deviation of consumption of housing services; in column (5) it is the correlation between the number of months worked and per capita total consumption; in column (6) it is the correlation between the number of months worked and consumption of

housing services; in column (7) it is the correlation between median consumption of housing services and total per capita consumption. All variables are in log. In columns (1), (4) and (6) housing prices are quality-adjusted and instrumented with foreign housing demand $\phi \ln \overline{b}$. In columns (2), (3), (5) and (7) the dependent variable is regressed directly on foreign housing demand $\phi_q \ln \overline{b}$. None of these second order effects are statistically significant, and they are also quantitatively small (relative to the large variation across households within provinces), which suggests that they are unlikely to overturn the first order effects of Table 8.

Table 13: Effects on second-order moments

	Standard Deviation of				*Correlation between*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Months worked	Ln(Tot cons)	Ln(Durable cons)	House cons	Empl-Cons	Empl-Hous	Cons-Hous
ln(Price) or $\phi \cdot \ln(\overline{b})$	0.45	0.03	0.10	0.03	-0.35	0.18	0.39
	(0.37)	(0.12)	(0.55)	(0.18)	(0.65)	(0.30)	(0.24)
Observations	588	588	587	588	538	536	588
Number of provinces	84	84	84	84	84	84	84
F stat	6.107	3.078	1.191	1.321	1.249	2.011	3.033

Notes: An observation is a province-year for each SHIW wave in the period 1993-2006. In columns (1), (4) and (6) housing prices are instrumented with foreign housing demand $\phi \ln \overline{b}$. In columns (2), (3), (5) and (7) the dependent variable is regressed directly on $\phi_q \ln \overline{b}$. In column (1) the dependent variable is the standard deviation of the number of months worked; in column (2) it is the standard deviation of per capita total consumption; in column (3), the standard deviation of per capita consumption in durable goods; in column (4), the standard deviation of consumption of housing services; in column (5), the correlation between the number of months worked and per capita total consumption; in column (6), the correlation between the number of months worked and consumption of housing services; in column (7), the correlation between median consumption of housing services and per capita total consumption. All variables are in log. All regressions include a full set of province and year fixed effects, the log share of tourism employment, the log share of construction employment, and the number of foreign firms. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

6 Conclusions

Housing is a factor of production and/or a durable consumption good that can be pledged to obtain financing. When housing prices rise, the financial capacity of households and firms could increase, stimulating labor demand, output, and consumption, which could increase welfare. At the housing price that maximizes welfare, the consumption gains induced by higher output are offset by the welfare losses due to the reduction in housing services and household leisure. This logic provides a simple sufficient statistic that can be used to evaluate whether housing prices are inefficiently low. We evaluated the welfare statistic in Italy using a novel share-shift instrument for housing prices that exploits the pronounced heterogeneity in the preferences of foreign nationalities for any given Italian province. We find evidence that a rise in housing prices increases local consumption significantly more than it decreases leisure and housing uses by locals, indicating that housing prices in Italy were inefficiently low. We found that changes in foreign direct investment, trade, tourism and construction do not account for the full empirical

evidence and that the collateral channel hypothesized by Chaney, Sraer, and Thesmar (2012) plays a role.

We believe our sufficient statistic is useful to detect whether steady state housing prices are optimal. In practice the level of housing prices might also have implications for business cycles and financial crises, as argued by Lorenzoni (2008), Bianchi (2011), Korinek (2011), Martin and Ventura (2016), Bianchi and Mendoza (2018), and Jeanne and Korinek (2019). In theory our sufficient statistic could be extended to a dynamic environment with cyclical fluctuations, but this avenue is not pursued here and left instead for further research. Addressing the issue would require an econometric strategy to identify dynamic elasticities in the data and modelling both the likelihood and the welfare consequences of financial crises provoked by excessive initial debt.

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Online Appendix
"Are Housing Prices too low?"

Appendix O1 discusses extensions of the basic theoretical framework. Appendix O2 further describes the data. Appendix O3 contains additional empirical results.

O1 Model appendix

We now extend the discussion of the extensions of the basic model discussed in the main text. For the sake of generality, we also introduce income and consumption taxes denoted by ω_n and ω_c , respectively. Taxes represent wedges that introduce additional sources of inefficiency in the allocation of resources, as in Prescott (2004). We denote

$$1-\overline{\omega}_n=\frac{1-\omega_n}{1+\omega_c}.$$

O1.1 Income effects

The household maximizes

$$U(c,h,e)=u\left(c\right)+\varphi\left(h\right)-\psi(e)$$

where

$$u\left(c\right)=\frac{c^{1-\frac{1}{\nu}}-1}{1-\frac{1}{\nu}},\qquad \nu\geq 0$$

The optimal household choice for labor now reads as follows

$$c^{-\frac{1}{\nu}}w=\frac{\overline{\psi}}{1-\overline{\omega}_n}e^{\frac{1}{\epsilon}} \tag{48}$$

which differs from (10) because of the presence of the marginal utility of consumption $c^{-\frac{1}{\nu}}$. The firm demand for capital, labour and housing remains unchanged, but after using the new labor supply condition in (48), we obtain that, for given housing prices p, firms demand for capital, for employment and for housing is now function of both p and c, which yields the function $k\left(p,c\right)$, $e\left(p,c\right)$ and $l_f\left(p,c\right)$. Given these new functions we also obtain that net output is also function of both p and c:

$$\overline{y}(p,c)=\left[k\left(p,c\right)\right]^{\alpha}\left[e\left(p,c\right)\right]^{\theta}\left[l_f\left(p,c\right)\right]^{1-\alpha-\theta}-k\left(p,c\right). \tag{49}$$

Similarly, the household demand for housing h (either owned or rented) is now given by

$$\overline{\varphi} \cdot (h)^{-\frac{1}{\xi}} = c^{-\frac{1}{\nu}} (1 - \overline{\omega}_h) rp \tag{50}$$

which implies that

$$h = h(p, c) = \left[\frac{\overline{\varphi} c^{\frac{1}{\nu}}}{(1 - \overline{\omega}_h) rp} \right]^{\xi} \tag{51}$$

Again (51) differs from (12) because of the presence of the marginal utility of consumption.

With income effects, the condition for market clearing in the housing market reads as follows:

$$l_f(p, c) + h(p, c) = L - \bar{l}_g - \frac{\overline{b}}{p}. \tag{52}$$

After solving for p, we can conclude that:

Proposition 3 (Exclusion restriction with income effects) *With income effects, the equilibrium housing price can be expressed as a function of government housing demand $\bar{l}_g$, consumption c and foreign housing demand $\overline{b}$, so that*

$$p = p(\bar{l}_g, c, \overline{b}). \tag{53}$$

For given p, and $\overline{b}$ equilibrium consumption c satisfies

$$c = \overline{y}(p, c) + r\left(b_0 + \overline{b}\right)$$

which, after solving for c, allows to express consumption as a function of both p and $\overline{b}$: $c = c\left(p, \overline{b}\right)$. Aggregate welfare is now given by

$$W^I = \frac{u\left(c\left(p, \overline{b}\right)\right) + \varphi\left(h(p, c\left(p, \overline{b}\right))\right) - \psi(e(p, c\left(p, \overline{b}\right)))}{1 - \beta} \tag{54}$$

To characterize the optimal housing price of housing we derive W^I in (54) with respect the housing price p to obtain

$$\frac{dW^I}{dp} \simeq H^I \equiv \mu_c \cdot \frac{\partial \ln\left[c\left(p, \overline{b}\right)\right]}{\partial \ln p} + \mu_h \cdot \frac{\partial \ln\left[h\left(p, c\right)\right]}{\partial \ln p} - \mu_e \cdot \frac{\partial \ln\left[e\left(p, c\right)\right]}{\partial \ln p} \tag{55}$$

where

$$\mu_c = 1 + \mu_h \frac{\partial \ln\left[h\left(p, c\right)\right]}{\partial \ln c} - \mu_e \frac{\partial \ln\left[e\left(p, c\right)\right]}{\partial \ln c}. \tag{56}$$

Now a change in consumption affects welfare through a direct effect but also through household demand for housing and employment. The shares μ_e and μ_h are still given by (18) and (19). The elasticity $\frac{\partial \ln\left[c\left(p, \overline{b}\right)\right]}{\partial \ln p}$ can still be calculated as in (21), which uses exogenous shocks in $\overline{b}$ as a source of exogenous variation for housing prices. Overall we can conclude that:

Proposition 4 (The optimal housing price with income effects) *With income effects, the equilibrium housing price p is lower than the optimal housing price p^* whenever H^I in (55) is positive.*

O1.2 Spill-overs

For simplicity we assume that there are two regions that interact through technological spill-overs and transfers in capital income. The two regions are perfectly symmetric and each region is characterized by a corresponding representative household $i = 1, 2$. The household in region i owns housing in the region. Foreign demand in region i is denoted by $\overline{b}_i$, $i = 1, 2$. Household i obtains part of her income as dividend payments our of the firm profits generated in the other region. In particular, household i has claims κ on the profits of firms in region i and claims $1-\kappa$ in the profits generated in the other region -i. So that the total dividend payments obtained by household i are equal to

$$D_{it} = \kappa \Pi_{it} + (1 - \kappa) \Pi_{\text{-}it}$$

where the profits in region $i = 1, 2$ are equal to $\Pi_{it} = \pi_{it} + (R_t - 1) d_{it}$. It is reasonable to assume that $\kappa \geq 1/2$. There are spill-overs from the production of region i to the production in other region -i, so that output in region i is equal to

$$y_i = A_i k_i^{\alpha} e_i^{\theta} \left(l_{f_i}\right)^{\gamma}$$

where, due to some spill-overs, the TFP parameter A_i of region i depends on the production in other region -i:

$$A_i = A(\overline{y}_{\text{-}i}), \tag{57}$$

Spill-overs might be due to terms of trade effects or to a pure technological externality as in Romer (1986). We use the labor supply condition in (10) together with the optimal demand for labor in (8), for capital in (6) and for housing in (7) to express the wage rate w_i, and the employment level e_i that clear the labor market in region i as a function of region-specific housing prices p_i and TFP A_i. This yields the functions $w_i = \widetilde{w}(p_i, A_i)$ and $e_i = \widetilde{e}(p, A_i)$. By extending the same logic to expenditures in capital inputs in region i k_i and to firms demand for housing l_{fi} we obtain that $k_i = \widetilde{k}(p_i, A_i)$, and $l_{fi} = \widetilde{l_f}\left(p_i, A_i\right)$. Finally, notice that also net output in region i can be expressed as a function of p_i and region specific TFP A_i:

$$\widetilde{\overline{y}}(p_i, A(y_{\text{-}i})) = \left[\widetilde{k}\left(p_i, A(\overline{y}_{\text{-}i})\right)\right]^{\alpha} \left[\widetilde{e}\left(p_i, A(\overline{y}_{\text{-}i})\right)\right]^{\theta} \left[\widetilde{l_f}\left(p_i, A(\overline{y}_{\text{-}i})\right)\right]^{1-\alpha-\theta} - \widetilde{k}\left(p_i, A(\overline{y}_{\text{-}i})\right), \tag{58}$$

which holds $\forall i = 1, 2$ and where we have used (57) to characterize TFP in region i. For given p_1 and p_2, (58) yields a system of two equations in the two unknowns $\overline{y}_1$ and $\overline{y}_2$, which can be solved to express

$$\overline{y}_i = \overline{y}(p_i, p_{-i}), \quad \forall i = 1, 2,$$

which also allow to define the function $e_i = e(p_i, p_{-i}) = \widetilde{e}\left(p_i, A(\overline{y}(p_i, p_{-i}))\right)$, and $l_{fi} = l_f\left(p_i, p_{-i}\right) = \widetilde{l_f}\left(p_i, A(\overline{y}(p_i, p_{-i}))\right), \quad \forall i = 1, 2$. After calculating profits in each region i, we can also conclude that dividend payments in region i are a function of p_i, and p_{-i}: $D_i = D(p_i, p_{-i})$. By taking the first order condition for household demand of housing services, we can again write

$$h_i = h(p_i) = \left[\frac{\overline{\varphi}}{(1 - \overline{\omega}_h)\,\rho p_i}\right]^{\xi} \tag{59}$$

Market clearing in the market for housing in region $i = 1, 2$ implies that

$$l_f\left(p_i, p_{-i}\right) + h(p_i) = L - \bar{l}_g - \frac{\overline{b}_i}{p_i}, \qquad \forall i = 1, 2 \tag{60}$$

where $l_f\left(p_i, p_{-i}\right)$ is firm demand for housing as characterized above. Equation (60) yields a system of two equations in the two unknowns p_1 and p_2 that can be solved to yield the market clearing price of housing. To sum up we can conclude that:

Proposition 5 (Exclusion restriction with spill-overs) *With spill-overs, the equilibrium housing price in every region i can be expressed as a function of government housing demand $\bar{l}_g$ (in the two regions), of foreign housing demand in the same region $\overline{b}_i$ and foreign housing demand in the other region $\overline{b}_{-i}$, so that*

$$p_i = p(\bar{l}_g, \overline{b}_i, \overline{b}_{-i}) \tag{61}$$

We use the fact that consumption in region i is equal to

$$c_i = c\left(p_i, p_{-i}, \overline{b}_i\right) = \overline{y}\left(p_i, p_{-i}\right) + r\left(b_0 + \overline{b}_i\right) \tag{62}$$

to write aggregate welfare as equal to

$$W^S = \frac{U(c\left(p_1, p_2, \overline{b}_1\right), h(p_1), e(p_1, p_2)) + U(c\left(p_2, p_1, \overline{b}_2\right), h(p_2), e(p_2, p_1))}{1 - \beta}$$

which corresponds to the sum of the utility of the representative households in the two regions. In symmetric equilibrium (when $p_1 = p_2 = p$ and $\overline{b}_1 = \overline{b}_2 = \overline{b}$), W^S implies that

$$\frac{dW^S}{dp} \simeq H^S \equiv \eta_c^S + \sigma_h \eta_h^S - \sigma_e \eta_e^S \tag{63}$$

where σ_h and σ_e are still given as in (19) and (18), while the elasticities of consumption, household demand for housing and employment with respect to a change in housing price in region i are equal to

$$\begin{aligned}
\eta_c^S &= \frac{\partial \ln \left[c\left(p_i, p_{-i}, \bar{b}\right)\right]}{\partial \ln p_i} + \frac{\partial \ln \left[c\left(p_i, p_{-i}, \bar{b}\right)\right]}{\partial \ln p_{-i}} \\
\eta_h^S &= \frac{d \ln h\left(p_i\right)}{d \ln p_i} \\
\eta_e^S &= \frac{\partial \ln \left[e\left(p_i, p_{-i}\right)\right]}{\partial \ln p_i} + \frac{\partial \ln \left[e\left(p_i, p_{-i}\right)\right]}{\partial \ln p_{-i}}
\end{aligned}$$

where we used the fact that (59) implies that household demand for housing prices is independent of the prices in connected prices. We can conclude that:

Proposition 6 (The optimal housing price with spill-overs) *When there are spill-overs across regions, the equilibrium housing price p is lower than the optimal housing price p^* whenever H^S in (63) is positive.*

O2 Data appendix

First we briefly describe the main data sources and then the construction of the variables.

Main data sources

SIT The Survey of International Tourism (SIT) is administered yearly by the Bank of Italy. Our sample spans the years 1997-2013. Every year between 130,000 and 150,000 foreign travelers to Italy are interviewed at any points of entry to Italy (national borders, ports, airports, train stations) and asked about the reason for their visit (business or tourism), the list of cities they will visit, the length of the visit, the planned expenditures for accommodation, food and other activities, whether they own a house in Italy and eventually where they own it. The interview also reports basic demographics, including the nationality of the interviewee.

SHIW The Survey of Households Income and Wealth (SHIW) is administered by the Bank of Italy to a representative sample of Italian resident households. It contains information on demographic characteristics of all household members, their occupational status and income sources, their consumption expenditures (both in durable and non durable goods or services) and imputed rents on all houses owned by the household and actual rents for all houses rented,

as well as detailed information on house characteristics. The survey was administered biannually (and sometimes triennially) from 1987 to 2011. Each wave surveys about 8,000 households from all over Italy. We use SHIW to obtain information on the province of residence of the household. The number of Italian provinces has changed over time. Since our empirical analysis rely on province fixed effects, we keep the geographical definition of provinces fixed through time using the 1993 province definition. We exploit information on the characteristics of dwellings: whether the dwelling is the "main residence", or for "vacation" or for "business"; its location "Isolated or countryside" or "Town outskirts" or "Between town outskirts or "Town centre"; its type "Luxury" or "Highly desirable" or "Middle income" or "Modest" or "Low income" or "Very low income" or "Rural" or "Other"; its age; its size (in squared meters); its number of bathrooms; and whether the property has been renovated. Two types of information are reported about the value of the house: the market price and the market rent. The former is an actual figure for households who have bought the property in the year. The latter is imputed both for households who have not bought the property in the year and for households who rent the house. The yearly rent is the actual rent paid by households who rent; it is imputed for house owners. We start from province in 92, there are 95, that we group Bergamo with Como For six provinces (Arezzo, Aosta, Belluno, Isernia, Parma, Rieti, Trieste) we have some missing information to construct the foreign demand instrument, is incomplete in some SIT waves and we exclude them and caltanisetta and Enna (no data on number of foreign business) and Trieste .

EWN The External Wealth of Nations (EWN) is a panel of around 190 countries reporting their foreign assets and liabilities over time since 1970, see Lane and Milesi-Ferretti (2007) for a detailed description of the data set. We use information on Foreign Direct Investment and Total Assets for every country in the panel. We detrend the two series by removing a full set of year world dummies. We use the beginning of period average value of assets in EWN (in 1970) as a normalization constant added to all series.

LFS "Rilevazione Continua sulle Forze di Lavoro" (LFS) by ISTAT provides the official labor market statistics for Italy. It is ran quarterly in the first week of January, April, July and October. It covers all household members of age between 15 and 89 and is representative of the entire Italian resident population. Every year, around 250,000 households are interviewed

covering around 600,000 Italian individuals. LFS is our source of data for total employment, the number of foreign white collars, employment in tourism activities, and employment in construction activities.

Variables construction

Housing price: We quality adjust yearly rental prices from SHIW by running the following regression:

$$\begin{aligned}\ln(\text{House\_rent}_{it}) = \; & p\left(q_i, t\right) + \beta_1 \ln(\text{House\_size}_{it}) + \beta_2 \ln(\text{House\_age}_{it}) + \\ & \beta_3 \text{House\_location}_{it} + \beta_4 \text{House\_type}_{it} + e_{it}\end{aligned}$$

where i indicates the household and t is the year and $p\left(q_i, t\right)$ is a province-year fixed effect for the province where household i resides. *house_location* and *house_type* are full sets of dummies describing the quality of the neighborhood and the building, as described above. We use the province$\times$ year fixed effects, $p\left(q_i, t\right)$ as a quality adjusted measure of housing prices in the province.

Employment: We measure employment in a province using the LFS. It is equal to the ratio between the number of individuals who report to have a job over the total population of age 15-64 living in the province.

Consumption (total or non durable): Total consumption is obtained from SHIW as the sum of consumption expenditures in durable goods and non durable goods or services. Expenditures in durable goods exclude housing. Consumption is deflated using the national CPI index and it is converted in per capita terms using the total population of age 15-64 living in the province from SHIW. Consumption expenditures in non durable goods or services is calculated analogously after dropping expenditures in durable goods.

Housing services: The consumption of housing services is quality adjusted by running the fol-

lowing regression:

$$\begin{aligned}\text{house\_rent}_{it} &= \beta_0 + \beta_1 \text{house\_size}_{it} + \beta_2 \text{house\_location}_{it} \times \text{house\_size}_{it} + \\ &\quad \beta_3 \text{house\_age}_{it} \times \text{house\_size}_{it} + \beta_4 \text{house\_type}_{it} \times \text{house\_size}_{it} + e_{it}\end{aligned}$$

where house_rent_{it} is the imputed rents from SHIW for household i. house_size is in squared meter, house_age in years. *house_location* and *house_type* are full sets of dummies describing the quality of the neighborhood and the building, as described above. For each household i we take the predicted values of the regression above and average them by province and year using the sample weights provided by SHIW. We take the province-year averages as a measure of real consumption of housing services per resident household in the corresponding province and year.

Wages: They are calculated using SHIW dividing the total annual income from "net wages and salaries" by the total number of working hours in the year. Annual working hours are the product of the average number of hours worked per week and the number of months worked in the year. Hourly wages are averaged by province and year using the sample weights provided by SHIW.

Firm debt: It is obtained using balance sheet data from the Italian Chamber of Commerce network (CERVED). CERVED covers the universe of firms registered at the Chamber of Commerce. Debt includes all short and long term firm debt to banks. It is constructed summing "consolidated debt towards banks" and "debt versus banks with maturity within the year". Firms are assigned to a province according to the location of their headquarter. We sum all firm debt within a province in a year, deflate the resulting sum by the national CPI and then divide the resulting value by the working age (15-64 years of age) in the province from LFS.

Expenditure by foreign tourists: SIT reports information on the amount (in Euros) spent by foreigners during their stay in Italy. The figure includes any expenditure made prior to the trip (for booking and reservations) and excludes the cost of traveling to Italy from the country of origin. Since SIT is available only starting from 1997, we impute values for earlier years in our sample (1993 and 1995) by fitting a quadratic trend allowed to vary by province and

foreign country pair. Total expenditures by foreigners in a province and year is the sum of the expenditures by each nationality who visits the province in the year, weighted by the relative importance of the nationality in the housing market of the province. Namely:

$$Foreigners\_Exp_{qt} = \frac{\sum_{s=1}^{S} o_{qs} \cdot Exp_{qst}}{\sum_{j=1}^{S} o_{qj}}$$

where o_{qs} is the number of homeowners from country s in province q and Exp_{qst} is the total expenditure by visitors from country s in province q and year t as obtained by aggregating the data in SIT (or their imputed values for the years 1993 and 1995).

Province-level trade: The Coeweb data set (available at `https://www.coeweb.istat`) by ISTAT provides data on all imports and exports at the province-year level by sector starting from 1993. For each year and province, Coeweb reports the value (in Euros) of the goods and services exported to any specific foreign country as well as the value of the goods and services imported by any specific foreign country. The value of exports and imports are disaggregated at the two-digits level using the ATECO classification. To be sure, the data contains the value of imports from the US to the province of Turin in the product category "Food products, beverages and tobacco", see Bratti, De Benedictis, and Santoni (2014) for a description and an analysis of the data set. Total exports from a province q in year t, X_{qt}, is equal to the sum of the value at t of all exports to any possible foreign country. Total imports to province q in year t, M_{qt}, is equal to the sum of the value at t of all imports from any possible foreign country. The trade volume is equal to $X_{qt} + M_{qt}$. The net trade balance is equal $X_{qt} - M_{qt}$.

Correlated shocks: To measure the productivity of the trade patterns of province q at t, we exploit the uniquely detailed trade data at the province level and combine it with sectoral level information at the country level from the Structural Analysis (STAN) database by the OECD. For each year t, country s and sector z, we use the STAN database to calculate labour productivity ℓ_{szt} as equal to the ratio of value added over the number of employees in sector z, country s and year t. Sectors are disaggregated at the two-digits level using the ATECO classification and STAN contains 33 countries. Since the data for value added and\or number of employees are not available for all country-sector-year triplet, we us a two-step imputation.
Step 1: For all country-sector pairs for which there are at least ten years of data we use the

available observations to estimate a quadratic trend for labor productivity at the country-sector level and use the estimated coefficients to extrapolate or interpolate any missing information. To minimize imputation error, we do not use the quadratic trend imputation whenever the distance between the out-of-sample data point and the closest in-sample data point is greater than 8 years.

Step 2: To impute observations for the country-sector pairs for which the procedure in Step 1 was unviable, we run a panel regression with the following specification:

$$\ell_{szt} = a_{st} + b_{zt} + e_{szt}$$

We use the estimated country-time fixed effects a_{st} and sector-time fixed effects b_{zt} to impute missing labour productivity for a sector-country-year as equal to $\ell_{szt} = a_{st} + b_{zt}$.

The productivity of the trade partners of province q at t is calculated separately for exports and imports. We restrict the analysis to the 33 country s present in the STAN database. On average, these countries represent around 75 percent of all imports of an Italian province q and 81 percent of all exports of the province. We exploit the great detail of the ISTAT trade flows data and measure the productivity of export trade partners $\widehat{S}^X_{qt}$ and import trade partners $\widehat{S}^M_{qt}$ of province q using (43) and (44) in the main text, where X^{93-95}_{qsz} is the value of all goods (or services) exported by province q to country s in sector z over the years 1993-1995 (divided by the population of province q) and X^{93-95}_{q} is the total value of all goods exported by province q over the same period to one of the 33 countries in the STAN database. Similarly M^{93-95}_{qsz} is the value of all goods imported by province q from country s in sector z over the years 1993-1995 (divided by the population of province q) and M^{93-95}_{q} is the total value of all goods imported by province q from all countries in the STAN database.

Employment in tourism: We calculate the fraction of employment in tourism activities over the total employment in the province and year using LFS. A worker is employed in tourism activities if if it is in working age and its occupation is one of the following: "Tecnici delle attivitá ricettive e professioni assimilate"; "Organizzatori di fiere, esposizioni ed eventi culturali"; "Organizzatori di convegni e ricevimenti"; "Animatori turistici e professioni assimilate"; "Professioni tecniche delle attività turistiche, ricettive ed assimilate"; "Esercenti ed addetti ai servizi alberghieri ed extralberghieri"; "'Esercenti ed addetti alla ristorazione ed ai pubblici esercizi"; "Professioni

qualificate nei servizi ricreativi, culturali ed assimilati"; "Commercianti ambulanti"; or "Personale non qualificato nei servizi turistici".

Employment in construction: We calculate the fraction of employment in construction activities over the total employment in the province and year using LFS. A worker is employed in construction activities if it is in working age its occuppation is one of the following: "Artigiani ed operai specializzati addetti alle costruzioni e al mantenimento di strutture edili"; "Artigiani ed operai specializzati addetti alle rifiniture delle costruzioni"; "Artigiani ed operai specializzati addetti alla pitturazione ed alla pulizia degli esterni degli edifici ed assimilati"; or "Artigiani ed operai specializzati addetti alla pulizia ed all'igiene degli edifici".

Number of foreign firms: The number of foreign firms in a province is from the ICE-Reprint database, which includes a census of affiliates of foreign MNE operating in Italy (Mariotti and Mutinelli (2010)). We have the stock of foreign firms active by province up to 1989 and use the net flow of new businesses for each year and province to calculate the number of foreign businesses in each province and year.

Foreign white collars: We construct the fraction of foreigners working in Italy in managerial positions using LFS. The number is scaled by the working age population (age 15-64) in the province and year. The worker is a foreign white collar if the worker is in working age and the worker is either a "Lawmaker, manager, entrepreneur born abroad" (in Italian "Legislatore, Dirigente, Imprenditore") or "Foreigner in intellectual, scientific or highly specialized jobs" (in Italian "Professioni intelettuali, scientifiche e di elevata specializzazione") or a "Technician, white-collar, qualified worker born abroad" (in Italian "Professione technica; impiegato; professione qualificata nelle attività").

Weights for foreign housing owners: SIT asks to foreigners whether their visit to Italy is for business or tourism. In the baseline specification we calculate the o_{qs}'s using all foreigners, in column 4 of Tables 3-6, O5, O8, and O9-O11, we calculate the o_{qs}'s by counting only foreigners visiting Italy for tourism. In column (2) of Tables O1-O4, O6 and O8, the o_{qs}'s are weighted by

the frequency at which visitors of different nationalities return to Italy, to correct for the fact that foreign owners of nationalities that cross the border more frequently might be over-represented in the number of foreign owners in a province, o_{qs}. To correct for this potential over-sampling bias, we rely on the following question in SIT: "How likely is it that you will come back to Italy within the next 12 months?" Possible answers are: "Surely" (to which we assign a *Return Probability* equal to 1), "Most likely" (*Return Probability* equal to 2), "Maybe" (equal to 3), "Probably not" (equal to 4), or "Surely not" (equal to 5). For each nationality we calculate the average value of its *Return Probability*: a high value for the average *Return Probability* indicates that foreign owners of that nationality are under-represented in the counting of foreign housing. To correct for this potential bias, we re-calculate the o_{qs}'s by giving a weight to a foreign owner of a given nationality equal to the product of the sample weight in SIT times the average *Return Probability* of the corresponding nationality.

O3 Additional evidence

In this section we report some additional evidence discussed in the main text.

During the Italian campaign, the Allied forces consisted of the VII US Army that fought in Sicily in 1943; the V US Army that fought in central and northern Italy in 1944 and 1945; the VIII British Army that was present for the entire Italian campaign; and the First Canadian Army that mostly gravitated close to the British Army but with some relevant differences even before it was redeployed to the northern European front in February 1945. Both the US and UK armies were composite of different nationalities: the V US Army included Brazilian and French soldiers. The VIII British Army included New Zealanders. Panel (a) in Figure O1 shows the movements of Allied troops through the entire Italian campaign. The movements by the British Army are in red, those by the US VII Army in gold and those by the US V Army's in blue. Panel (b) of Figure O1) shows the two main German Operational Zones: the Alpine Foothill, including the provinces of Belluno, Trento and Bolzano; and the Adriatic Littoral, including the provinces of Gorizia, Pordenone, Udine and Trieste. The Nazi Operational Zones were areas for future annexion to the Nazi empire where local political leaders were replaced by new German born officials, the German and Italian languages were treated equally and German citizens were relocated to live there permanently.

Figure O1: The WWII episode

(a) Movements of Allied troops in Italy, 1943-1945

(b) German Operational zones in Italy

Table O1: First stage: Further robustness

	(1) No Hedonic	(2) Return prob	(3) No big prov	(4) No mkt value	(5) Tot assets	(6) Foreign white coll.
Foreign demand, $\phi \cdot ln(\bar{b})$	0.42**	0.46***	0.62***	0.54***	0.89**	0.72***
	(0.19)	(0.16)	(0.17)	(0.18)	(0.35)	(0.19)
ln(Tourism empl.)	0.05*	0.04	0.04	0.04	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln(Construction empl.)	0.08*	0.11**	0.11**	0.10**	0.10**	0.08
	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)
No. of foreign firms	0.00	0.00*	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Foreign white collars)						0.06***
						(0.02)
Observations	588	588	553	587	588	405
Number of provinces	84	84	79	84	84	84
$\varkappa$	.01	.02	.02	.02	.03	.02
F stat	4.848	8.055	14.19	9.410	6.261	15.21

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the (logged) housing price quality adjusted, except in column (1) where it is the (logged) yearly rents in SHIW without any hedonic adjustment. Foreign housing demand is $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. The regressions include a full set of province and year fixed effects. In column (2) the weights used to construct foreign demand in (40) are adjusted to reflect the frequency of the visits to Italy by foreign owners. In column (3), we drop from the sample all provinces with a population greater than 2 millions (Rome, Milan, Naples and Turin). In column (4) the instrument is constructed after excluding foreign countries who report their FDI at market value rather than at book value and in column (5) the instrument is constructed using Total assets rather than FDI. In column (6) we control for the logged share of foreign white collars over total employment in the province. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O2: Employment: Further robustness

	(1) No hedonic	(2) Return prob	(3) No big prov	(4) No mkt value	(5) Tot assets	(6) Foreign white coll.
ln(Price)	0.33*	0.28**	0.24**	0.25**	0.32**	0.21**
	(0.19)	(0.14)	(0.10)	(0.11)	(0.15)	(0.09)
ln(Tourism empl.)	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ln(Construction empl.)	0.01	0.00	0.01	0.01	0.00	0.02
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
No. of foreign firms	0.00	0.00	0.00	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Foreign white collars)						-0.01
						(0.01)
Observations	588	588	553	587	588	405
Number of provinces	84	84	79	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is (logged) per capita employment in the province. Housing prices are quality adjusted, except in column (1) where we use the logged yearly rent in SHIW without any hedonic adjustment. Housing prices are instrumented with foreign demand $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. The regressions include a full set of province and year fixed effects. In column (2) the weights used to construct foreign demand in (40) are adjusted to reflect the frequency of the visits to Italy by foreign owners. In column (3), we drop from the sample all provinces with a population greater than 2 millions (Rome, Milan, Naples and Turin). In column (4) the instrument is constructed after excluding foreign countries who report their FDI at market value rather than at book value and in column (5) the instrument is constructed using Total assets rather than FDI. In column (6) we control for the logged share of foreign white collars over total employment in the province. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O3: Housing services: Further robustness

	(1) No hedonic	(2) Return prob	(3) No big prov	(4) No mkt value	(5) Tot assets	(6) Foreign white coll.
ln(Price)	-0.83	-0.68**	-0.54**	-0.63**	-0.67**	-0.51**
	(0.55)	(0.32)	(0.24)	(0.27)	(0.33)	(0.21)
ln(Tourism empl.)	0.05	0.04	0.04	0.04	0.04	0.04
	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
ln(Construction empl.)	0.07	0.08	0.06	0.07	0.08	0.03
	(0.08)	(0.06)	(0.05)	(0.05)	(0.06)	(0.06)
No. of foreign firms	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Foreign white collars)						0.02
						(0.01)
Observations	588	588	553	587	588	405
Number of provinces	84	84	79	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the (logged) per capita median consumption of housing services in the province. See legend to Table O2 for further details.

Table O4: Consumption: Further robustness

	(1) Nondurables	(2) Return prob	(3) No big prov	(4) No mkt value	(5) Tot assets	(6) Foreign white coll.
Foreign demand, $\phi \cdot ln(\bar{b})$	0.84**	0.65**	0.81***	0.76**	1.01	0.90***
	(0.32)	(0.31)	(0.30)	(0.30)	(0.64)	(0.28)
ln(Tourism empl.)	0.04*	0.06**	0.05**	0.06**	0.06**	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Construction empl.)	0.07	0.08*	0.07	0.08*	0.08*	0.11*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)
No. of foreign firms	0.00	0.00	-0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Foreign white collars)						0.02*
						(0.01)
Observations	588	588	553	587	588	405
R-squared	0.39	0.38	0.37	0.38	0.38	0.37
Number of provinces	84	84	79	84	84	84
Implied elast.	1.27	1.15	1.11	1.19	1.01	1.08
F stat	23.47	25.05	23.41	25.18	23.88	21.50

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is logged per capita total consumption expenditures in the province except in column (1) where it is consumption expenditures in nondurables. Foreign housing demand is $\phi \ln \bar{b}$ where $\bar{b}$ and ϕ are given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects, the logged share of employment in tourism activities, the logged share of employment in construction, and the number of foreign firms. In column (2) the weights used to construct foreign demand in (40) are adjusted to reflect the frequency of the visits to Italy by foreign owners. In column (3), we drop from the sample all provinces with a population greater than 2 millions (Rome, Milan, Naples and Turin). In column (4) the instrument is constructed after excluding foreign countries who report their FDI at market value rather than at book value and in column (5) the instrument is constructed using Total assets rather than FDI. In column (6) we control for the logged share of foreign white collars over total employment in the province. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O5: Wages: Further robustness I

	(1) Correlated shocks	(2) Interactive factor	(3) Tourist expend.	(4) Trade	(5) Tourist weights	(6) Foreign white coll.	(7) Wealth
ln(Price)	0.44**	0.47**	0.47*	0.46*	0.44*	0.50**	0.45**
	(0.21)	(0.21)	(0.26)	(0.25)	(0.24)	(0.20)	(0.22)
Observations	588	588	578	588	588	405	588
Number of provinces	84	84	84	84	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the logged average monthly wage in the province. Housing prices are quality adjusted and instrumented with foreign demand $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects, the logged share of employment in tourism activities, the logged share of employment in construction, and the number of foreign firms. In column (1) we also control for the (sector-level) productivity of all countries from which province q imports goods as well as the productivity of all countries to which province q exports goods. In column (2) we control for interactive fixed effects as in Bai (2009). In column (3) we control for the direct expenditure by foreign visitors in the province; in column (4) for province-level net export (logged exports divided by imports); in column (6) for the logged share of foreign white collars over total employment; and in column (7) for the median household wealth in the province. In column (5) weights are constructed after excluding foreigners who visit Italy for business related motives. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O6: Wages: Further robustness II

	(1) No hedonic	(2) Return prob	(3) No big prov.	(4) No mkt value	(5) Tot assets
ln(Price)	0.61*	0.49*	0.49**	0.46**	0.37
	(0.36)	(0.25)	(0.20)	(0.23)	(0.25)
Observations	588	588	553	587	588
Number of provinces	84	84	79	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the logged average monthly wage in the province. Housing prices are quality adjusted, except in column (1) where we use the logged yearly rent in SHIW without any hedonic adjustment. Housing prices are instrumented with foreign demand $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects, the logged share of employment in tourism activities, the logged share of employment in construction, and the number of foreign firms. In column (2) the weights used to construct foreign demand in (40) are adjusted to reflect the frequency of the visits to Italy by foreign owners. In column (3), we drop from the sample all provinces with a population greater than 2 millions (Rome, Milan, Naples and Turin). In column (4) the instrument is constructed after excluding foreign countries who report their FDI at market value rather than at book value and in column (5) the instrument is constructed using Total assets rather than FDI.

Table O7: Debt: Further robustness I

	(1) Correlated shocks	(2) Interactive factor	(3) Tourist expend.	(4) Trade	(5) Tourist weights	(6) Foreign white coll.	(7) Wealth
ln(Price)	1.08*	1.54***	1.22*	1.39*	1.08	0.62	1.12*
	(0.63)	(0.57)	(0.74)	(0.77)	(0.68)	(0.51)	(0.62)
Observations	588	588	578	588	588	405	588
Number of provinces	84	84	84	84	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the logged per capita firm debt toward banks in the province. The other details are as in the legend to Table O5.

Table O8: Debt: Further robustness II

	(1) No hedonic	(2) Return prob	(3) No big prov.	(4) No mkt value	(5) Tot assets
ln(Price)	1.52	1.18	0.90	1.13*	1.01
	(1.05)	(0.80)	(0.57)	(0.67)	(0.73)
Observations	588	588	553	587	588
Number of provinces	84	84	79	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the logged per capita firm debt toward banks in the province. The other details are as in the legend to Table O6.

Table O9: Income effects, first stage

	(1) Baseline	(2) Correlated shocks	(3) Tourist expend.	(4) Trade	(5) Tourist weights	(6) Foreign white coll.	(7) Wealth
Foreign demand, $\phi \cdot ln(\overline{b})$	0.34**	0.37**	0.28*	0.27	0.28*	0.45**	0.38**
	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)	(0.18)	(0.17)
ln(Consumption)	0.30***	0.29***	0.30***	0.30***	0.30***	0.30***	0.26***
	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.07)	(0.06)
Observations	588	588	578	588	588	405	588
Number of provinces	84	84	84	84	84	84	84
$\varkappa$	.01	.01	.01	.01	.01	.02	.01
F stat	4.287	5.250	2.880	2.455	3.105	6.239	5.114

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is the logged housing price. Housing foreign demand is $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects, the logged share of employment in tourism activities, the logged share of employment in construction, and the number of foreign firms. In column (2) we also control for the (sector level) productivity of all countries from which province q imports goods as well as for the productivity of all countries to which province q exports. In column (3) we control for interactive fixed effects as in Bai (2009); in column (4) for the direct expenditure by foreign visitors in the province; in column (5) for the province-level trade imbalance (logged exports divided by imports); in column (6) for the logged share of foreign white collars over total employment in the province; and in column (7) for median household wealth in the province. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O10: Employment with income effects: Further robustness

	(1) Correlated shocks	(2) Interactive factor	(3) Tourist expend.	(4) Trade	(5) Tourist weights	(6) Foreign white coll.	(7) Wealth
ln(Price)	0.36*	0.76**	0.46	0.50	0.45	0.32*	0.36*
	(0.20)	(0.39)	(0.31)	(0.36)	(0.30)	(0.17)	(0.20)
ln(Consumption)	-0.09	-0.23*	-0.13	-0.14	-0.12	-0.09	-0.09
	(0.06)	(0.13)	(0.10)	(0.12)	(0.10)	(0.06)	(0.06)
ln(Tourism empl.)		-0.01	0.01	0.01	0.01	0.02	0.01
		(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
ln(Construction empl.)		-0.03	-0.01	-0.00	-0.00	0.02	0.00
		(0.05)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
No. of foreign firms		-0.00	-0.00	-0.00	-0.00	-0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Bai (2009) interactive factor		0.87***					
		(0.22)					
ln(Tourist expenditure)			-0.00				
			(0.01)				
ln(Exports/Imports)				0.03			
				(0.03)			
ln(Foreign white collars)						-0.01	
						(0.01)	
ln(Household wealth)							-0.02
							(0.02)
Observations	588	588	578	588	588	405	588
Number of provinces	84	84	84	84	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is logged per capita employment in the province. Housing prices are instrumented with foreign demand equal to $\phi \ln \overline{b}$ where $\overline{b}$ and ϕ are given in (40) and (42), respectively. All regressions include a full set of province and year fixed effects, the logged share of employment in tourism activities, the logged share of employment in construction, and the number of foreign firms. In column (1) we also control for the (sector-level) productivity of all countries from which province q imports goods as well as the productivity of all countries to which province q exports goods. In column (2) we control for interactive fixed effects as in Bai (2009); in column (3) for the direct expenditures by foreign visitors to the province; in column (4) for province-level trade imbalance (logged exports divided by imports); in column (6) for the logged share of foreign white collars over total employment in the province; and in column (7) for median household wealth in the province. In column (5) the weights used to construct foreign demand exclude foreigners who visit Italy for business related motives. Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.

Table O11: Housing services with income effects: Further robustness

	(1) Correlated shocks	(2) Interactive factor	(3) Tourist expend.	(4) Trade	(5) Tourist weights	(6) Foreign white coll.	(7) Wealth
ln(Price)	-1.14*	-2.08**	-1.54	-1.59	-1.43*	-1.09**	-0.97**
	(0.58)	(1.06)	(0.95)	(1.01)	(0.86)	(0.50)	(0.45)
ln(Consumption)	0.43**	0.67*	0.57*	0.59*	0.54*	0.47**	0.27*
	(0.19)	(0.35)	(0.31)	(0.33)	(0.29)	(0.19)	(0.14)
ln(Tourism empl.)		0.05	0.03	0.04	0.04	0.03	0.02
		(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
ln(Construction empl.)		0.21	0.12	0.12	0.12	0.03	0.08
		(0.14)	(0.11)	(0.11)	(0.10)	(0.08)	(0.06)
No. of foreign firms		0.00	0.00	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Bai (2009) interactive factor		1.29***					
		(0.30)					
ln(Tourist expenditure)			0.00				
			(0.03)				
ln(Exports/Imports)				-0.08			
				(0.08)			
ln(Foreign white collars)						0.04	
						(0.03)	
ln(Household wealth)							0.26***
							(0.05)
Observations	588	588	578	588	588	405	588
Number of provinces	84	84	84	84	84	84	84

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. The dependent variable is logged median consumption of housing services in the province. The other details are as in the legend to Table O10.

Table O12: First stage results for the model with spill-overs

	SECTORAL DISTANCE			*GEOGRAPHICAL DISTANCE*		
	(1)	(2)	(3)	(4)	(5)	(6)
	ln(Price)	ln(Price) in close provinces	ln(Price) in distant provinces	ln(Price)	ln(Price) in close provinces	ln(Price) in distant provinces
$\phi \cdot \ln(\bar{b})$	0.59***	-0.42	0.70**	0.52**	-0.23	0.58
	(0.22)	(0.43)	(0.31)	(0.26)	(0.23)	(0.55)
$\phi \cdot \ln(\bar{b})$ in close provinces	0.57*	8.09***	1.38***	1.25**	10.70***	-1.16*
	(0.34)	(0.60)	(0.37)	(0.55)	(0.60)	(0.69)
$\phi \cdot \ln(\bar{b})$ in distant provinces	-0.66	-4.73***	10.40***	0.82**	-0.71**	9.60***
	(0.58)	(0.83)	(0.70)	(0.37)	(0.27)	(0.27)
Observations	588	588	588	588	588	588
Number of provinces	84	84	84	84	84	84
F stat	25.79	834.3	203.7	22.99	127.7	389.7

Notes: An observation is a province-year for each SHIW wave over the period 1993-2006. In columns (1)-(3), distance is measured as the sum of the absolute difference in sectoral employment share between the two provinces; in columns (4)-(6) it is geographical distance (in km). Robust standard errors are in parentheses with p-value denoted by *** if p<.01, ** if p<.05, and * if p<.1.