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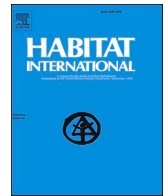
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Preserving enough? A randomised controlled trial approach to determine relevant urban planning regulations for small touristic towns – A case of Chiloé, Chile

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ABSTRACT

Rapid tourism growth in small towns of unique cultural heritage often leads to sudden building renovation and infrastructure expansion, which can compromise their attractiveness. The typically under-resourced urban planning departments of the Global South face a complicated task in establishing planning regulations that can preserve a town's identity while accommodating these rapid transformations. This requires a delicate regulatory equilibrium – too restrictive an urban plan could hinder investment and local growth, while a less restricted approach risks destroying a town's heritage, identity, and touristic appeal. This study presents a randomised controlled trial in which residents and tourists rate a town's visual identity using photo simulations of 27 different planning regulation scenarios, drawing from a real-life conservation plan on the island of Chiloé (Chile). We test the effectiveness of this method for identifying which building regulations are relevant for preserving a town's identity. This low-cost and rapidly implemented method may complement the work of urban planners in setting the regulatory framework for conservation.

1. Introduction

When a town of significant cultural heritage sees an influx in tourist visitors, local communities are presented with welcome economic opportunities (Bandarin & Van Oers, 2012), however, the town also faces significant pressure for new urban development that, if poorly managed, can hinder longer-term tourism by compromising its cultural identity and attractiveness. In places of historic value, pressure from real estate development to accommodate square-foot demand for tourist-tailored services can result in dramatic transformations of the built environment (Cocola-Gant, 2018). In a time of globalised tourism and architecture, historic buildings and spaces are valuable goods contributing to the branding of a town, allowing it to distinguish itself as a unique tourist destination, and to extract monopolistic rents (Harvey, 2002). For Hiernaux and Gonzalez (2014), however, the tourism industry itself produces its own symbolic and material spaces, and introduces foreign interests, identities, and values that are inherently juxtaposed against those of local communities and erode the uniqueness of a town. Tourism therefore does not necessarily promote a town's long-term economic

sustainability (Delgadillo, 2015; Harvey, 2002) – Canavan (2014) notes that these tourism-driven changes to a town's urban fabric can damage its cultural image and identity, over time eroding its attractiveness, decreasing tourist demand, and hindering the local economy.

Managing the conflicting objectives of touristic infrastructure development and heritage preservation remains a central challenge of local development, notably for towns in the Global South, where urban planning regulations can be broadly defined, historic areas are largely unprotected, and even small increases in tourist demand can lead to dramatic transformations of the built environment. The dilemma of economic development versus conservation is particularly acute in small towns in the developing world with the capacity to become sites of heritage tourism, since their need for economic activation and employment provision is a top priority of local authorities and communities (Chhabra, 2009; Hampton, 2005). The tourism industry has the potential to transform the economy of these localities by bringing in new streams of income and increasing consumer demand for locally sourced services, consequently facilitating the creation of local enterprises and employment, and diversifying service and recreational opportunities

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(Bandarin & Van Oers, 2012). Stringent urban planning regulations can therefore create excessive burdens for investors, preventing or slowing down a town's economic reactivation (Safaeva et al., 2019). In this sense, urban planning regulation matters not only when we wish to preserve historical elements to maintain the authenticity of a site, but also to ensure that new building developments are delivered at a pace that maximises local economic opportunities.

Addressing this dilemma requires local heritage management strategies that treat the built environment as a tourism resource (Ho & McKercher, 2004), in which the perceived image of the destination, from both local and visitor perspectives, becomes a key focus of preservation (Baloglu & McCleary, 1999; Buhalis, 2000; Castro et al., 2007; Chi & Qu, 2008; Prayag & Ryan, 2012). Traditional strategies have been centred on top-down approaches favouring 'expert' opinions (Chirikure et al., 2010; Lin & Hsing, 2009), both public and private, however this challenge of balancing growth and conservation depends on the involvement of local communities as key stakeholders in heritage management plans, since the original built environment is nothing less than a reflection of their local practices, and it is these communities that ultimately end up as the winners or losers in any local development strategy (Aparicio-Rengifo et al., 2023; Black & Wall, 2001; Kovacs et al., 2015; Yankholmes, 2013; Zhao et al., 2020). Therefore, it is necessary to develop different methodological approaches and tools that are affordable for local governments, and that enable them to identify what is and is not valued about a place – valued not only by tourists but also by locals – and therefore to determine what must be preserved.

This paper proposes an affordable and flexible methodological approach for assessing the impact of built environment regulations on the perception of a town's identity while addressing some of the confounding factors of inferential studies and surveys. We test this approach using the recent regulation plan for central Chonchi, a historic town centre on the island of Chiloé (southern Chile) currently experiencing rapid tourism growth and built environment transformations. To carry out our study, we used realistic photo simulations based on various regulatory proposals for the built environment, using unregulated and regulated scenarios, to construct a randomised control trial (RCT) in which 100 locals and tourists were asked to assess their perception of the town's identity based on the images.

In our study, we first assess whether this methodological approach can detect significant damage to a town's identity due to a lack of planning regulations, and whether respondents' evaluations depend on their personal characteristics and attitudes. Second, we contrast the impact of two regulatory dimensions – those regulating building form versus building details – while testing if the method can detect specific deregulations that are particularly harmful to a town's identity. Then, we present an explicit study of heritage regulation that adds robust causal evidence to existing urban research on the relationship between building regulation and perceived local identity. This image-based RCT methodology can provide a means of testing the impact of planning regulations in other towns that are suffering from similar processes of tourist-driven transformation of their built environment.

2. Literature review

2.1. Tourism development and heritage conservation

Heritage tourism offers an experience in which visitors to an area can tour historic cultural sites and participate in activities that reflect traditional customs in an authentic way (Chaudhary & Aggarwal, 2012). This type of tourism offers the potential to sustain and improve the local economy of small towns with historical significance, resulting in increased local jobs. Moreover, the growth of the tourism sector can see increased demand for other local services, which can help to compensate for any depressed primary or secondary local sectors (Smith, 2009). Heritage tourism can therefore play a critical role in the transformation of a small-town economy and generate important social benefits

(Bandarin & Van Oers, 2012).

In his 'art of rent' theory, Harvey (2002) proposes that towns with historic value possess unique and non-replicable characteristics that allow them to obtain a higher-than-market-value stream of income over the long term, as private actors are willing to pay premiums for their consumption. Uniqueness then is the key for these towns to be able to extract this monopolistic rent. This extraction is done through direct and indirect mechanisms: direct monopolistic rents are related with the sale and rental of material assets – in our case, buildings located in and close to city areas of historic value – while indirect monopolistic rents are obtained through commodities or services that, due to their affiliation with a historic area, can be sold for a premium – for instance, overnight prices in a hotel.

Authors underline that these monopolistic rents at least three indirect economic benefits for local economies: investment, economic growth, and job creation (Chen & Chen, 2010; Hampton, 2005; Orbasli, 2000; Simpson, 2008; Wall & Mathieson, 2006; Zhang et al., 2015). First, entrepreneurs and external companies recognise a profit opportunity in a small town and invest in infrastructure to provide tourist services. Second, the increased attractiveness of an area draws in new visitors who purchase goods and services – such as accommodation, food, and site visits – increasing the demand for existing businesses and spawning the creation of new local services. Finally, the increased direct demand for touristic infrastructure and services, as well as the need to create infrastructure, spill over into other sectors of the economy and increase the demand for labour, increasing local job numbers and household incomes.

To maximise these local economic benefits, the public and private sectors often develop infrastructure investment programs to accelerate the development of local heritage tourism markets (Roldán, 2023). Public actions tend to favour heritage-led development regeneration, with programs targeting regeneration of historic buildings and conservation areas to improve a town's competitiveness in a global capitalist economy (Harvey, 2007; Hui et al., 2021; Zhao et al., 2020). Private investment has focused mostly on the development of new accommodation infrastructure and retail services, a strategy often welcomed by city governments as, in the short term at least, it revives and protects degraded infrastructure in heritage areas (Chhabra, 2009). For these reasons, over the past decade, academic and international policy circles have underlined the development of cities of cultural heritage as touristic destinations as a central strategy to promote their economic development (Eken et al., 2019; Guzman et al., 2017; Nurse, 2006; Roders & van Oers, 2011; United Nations, 2012).

The rapid and poorly managed development of a touristic destination, however, often leads to significant transformation of the built environment that can hamper the location's heritage appeal. Authors warn that, as visitor numbers increase, demand for new and better infrastructure fuels a profit-driven real estate industry that often privileges short-term goals and 'alien architecture', reflecting globalised preferences rather than the local identity (Bao & Su, 2004; Yang et al., 2008). For instance, Ho and McKercher's (2004) study shows how increased commercial activities in Hong Kong have led to the degradation of built heritage through intensive tourist use, commodification, and trivialisation, while Harvey (2002) notes how the appeal of Barcelona for multinational investment has seen local shops replaced with international brands and brought modern architecture to the waterfront, making it increasingly resemble other globalised western cities. Another example can be seen in Yang et al.'s (2008) study describing the damaging appearance of concrete and brick hotels within traditional bamboo- and wooden-house villages in Xishuangbanna, China. Harvey (2002) notes the contradiction here: since historical towns with improved modern infrastructure are easier to promote, these very improvements might homogenise and erode their unique qualities, jeopardising future visitor numbers and ultimately undermining the town's unique advantages.

On this point, Harvey (2002) argues that, to sustain the direct and

indirect local economic benefits of monopolistic rents, a place must remain sufficiently unique to sustain premium income in a fierce touristic economy. Freezing development around heritage sites might seem a tempting option here, however stringent regulations can also stifle the potential of a place, preventing the development of a viable tourism industry and hindering local economic prosperity (Yang et al., 2008). It is therefore imperative that an urban plan can balance the conservation of heritage values with adequate flexibility to permit the controlled development of local tourism to allow a sustainable harvest of its socioeconomic benefits. Striking this balance has indeed attracted the interest of the urban studies and planning fields for many years (Guzman et al., 2017), and several studies have underlined the important role of urban planning as an instrument to regulate and safeguard a dynamic conservation and development strategy (Bobic & Akhavan, 2022; Hayllar et al., 2010; Li et al., 2020; McKercher et al., 2005; Wang & Bramwell, 2012).

Although scholars agree that reconciling heritage conservation with tourism development is central to achieving real progress in sustainable tourism (McKercher & Du Cros, 2002; McKercher et al., 2005; Wang & Bramwell, 2012), this presents particular challenges for developing countries and their small towns (Fagundez D'Anello & Cabrera Canabese, 2022; Landorf, 2009; Li et al., 2008; Nunkoo & Ramkissoon, 2011). Reid et al. (2004) underline that an eagerness for sources of investment and job creation are often met with insufficient local public resources – both economic and technical – to develop comprehensive heritage conservation plans. Pietossi et al. (2023) see four major challenges for building heritage preservation in the developing world: lack of awareness of a place's uniqueness and cultural value; lack of capacity to adapt old buildings to adhere to current regulations and accommodate contemporary uses; lack of economic capacity to cover costly renovations; and lack of professional construction and planning knowledge to set effective preservation strategies. In these contexts, the immediate need to overcome poverty, create jobs, or provide infrastructure can often lead to an overvaluing of the positive impacts of tourism development, ignoring the long-term negative consequences of built environment transformation (Reid et al., 2004). Moreover, conservation and improvement of built heritage is costly and competes with essential public services for local resources, leaving municipalities in great need of external sources of funding. For Bramwell (2006), this gives real estate investors capacity to exert pressure and negotiate on the urban planning agenda, favouring regulations that privilege short-term profits rather than sustainable tourism.

2.2. Authenticity and image of a place

One of the central factors defining a town's heritage appeal is the perception of authenticity (ICOMOS, 1964, 1994; UNESCO, 1977, 1994). A number of authors have studied how authenticity is a key determinant of tourists' behaviour, satisfaction, level of involvement, and likelihood of return to a location (Alcañiz et al., 2009; Ashworth & Goodall, 1988; Cohen, 1988; Cooper et al., 1993; Lu et al., 2015; Mansfeld, 1992; O'leary & Deegan, 2003; Taylor, 2001; Waitt, 2000; Yi et al., 2018). Authenticity is assessed through elements of both tangible and intangible heritage such as form and design, materials and substance, use and function, traditions and techniques, spirit and feeling, and language (Dai, 2021; UNESCO, 2005). This assessment is done via two main approaches: 'essential heritage authenticity', where places are considered to have universal heritage value and are typically assessed by experts for the purpose of heritage conservation; and 'staged' or 'perceived authenticity', which is assessed through people's subjective and dynamic experiences of heritage places (Dai et al., 2021; MacCannell, 1992). The former is an approach commonly used by public offices, including the World Heritage Committee, States Parties, and the International Council of Monuments and Sites (Dai et al., 2021). However, the latter approach goes beyond a judgement of authenticity on intellectual grounds, drawing also from emotional experiences built through

visitors' interactions with objects and/or activities within a place (Wang et al., 2015). Authors highlight that perceived authenticity is essential in heritage tourism to maximise tourist satisfaction (Hedblom et al., 2019a; Hernández-Mogollón et al., 2013), perceived cultural value (Akhoondnejad, 2016; Chen & Chen, 2010) and behavioural intention to travel (Lin & Liu, 2018). Perceived authenticity is thus closely related with a town's touristic appeal, and by extension with the potential to extract direct and indirect local economic benefits (Dai et al., 2021). Since we focus in this study on the link between touristic appeal, heritage planning and local economic benefits, we follow the 'perceived authenticity' approach widely used in cultural heritage planning and touristic management. Indeed, the difference may not be so stark: authors have interrogated the need of such a fundamental divide between 'perceived' and 'essential' authenticity in empirical studies, with Dai et al. (2021) designing a study using a structural equation model to contrast tourist and expert views on historical sites in China, and finding that in practice the two approaches often aligned.

Scholars concur that a central element of perceived authenticity in tourism is a town's historic image, which plays a major role in a tourist's decision to visit a place or not (Ashworth & Goodall, 1988; Cooper et al., 1993; Mansfeld, 1992; O'leary & Deegan, 2003; Alcañiz et al., 2009; Lu et al., 2015). Lynch's (1964) seminal work proposes that this 'imageability' of a place is not built by an exact representation of every minute aspect constituting its built environment, but rather by our construction of a mental synthesis where key outstanding characteristics of the built environment are used to distinguish, recognise and navigate urban spaces. While each individual builds their own representation of a place, remarkable city elements become common reference points used by most people to mentally represent urban space, becoming the [mental] image of a city. From a heritage tourism viewpoint, outstanding historic built environment qualities become common clues that people use to construct notions of authenticity (Boyd, 2002; Gospodini, 2001; Sepe & Pitt, 2014). Preserving relevant visual conditions is thus central to sustaining a location's touristic appeal (Schulz, 1980; Sepe & Pitt, 2014).

Gospodini (2001) draws a further connection between a town's image and perceived authenticity, noting that tourists assess authenticity through the uniqueness of a place's traditional architecture, built environment, and natural landscapes (Lu et al., 2015). Similarly, Sepe and Pitt (2014) and Schulz (1980) emphasise that this authenticity depends on visible and concrete urban elements, and how they interrelate to create an 'atmosphere' as a whole (Luo et al., 2022). To more tightly define this concept of a town's image, Kropf (1996) sees it as being constructed from seven visual elements of the built environment: 1) materials; 2) structures (e.g. types of walls and roofs, including construction details); 3) enclosures or spaces; 4) buildings; 5) plots; 6) streets and blocks; and 7) urban fabric. Thus, planning regulations that preserve these conditions play a vital role in the process of maintaining the authenticity and uniqueness of a place, and in turn can drive the rise or decline of touristic travel patterns.

By understanding the key elements of the built environment, and the spatial relationship between various urban components, that constitute people's mental image of historic towns, we can define more clearly the limits on material transformation that a place can undergo before compromising its sense of authenticity placing at risk direct and indirect economics benefits for the local economy (Karimi, 2000). These limits can then be reflected in a minimal set of planning regulations to preserve the authenticity that makes a small town attractive in the first place.

2.3. Community participation in tourism development planning

A collaborative, bottom-up approach drawing on community participation is necessary for sustainable tourism development strategies (Cohen-Hattab, 2013; Guzmán et al., 2017; Li & Hunter, 2015; Su & Wall, 2014; UNESCO, 2012; UNWTO, 2008; Waligo et al., 2013). Given that the local community should be the recipient of the economic and social benefits of sustainable tourism, its engagement is fundamental

when defining objectives, determining actions, and ensuring that cultural heritage plans do indeed work to its benefit (Li et al., 2016; Zhao et al., 2020). Moreover, any urban environment reflects a local community of culture, practices, and techniques, and so those who were integral in a town's formation must then play a significant role in its regeneration, to ensure that its local essence is maintained. Black and Wall (2001) propose that, by involving communities, local governments can create a joint visualisation of a place's potential, along with an understanding of what can change and what needs to be preserved to maintain authenticity.

Many heritage urban planning strategies, however, prioritise non-local expert input over community involvement (Dragouni & Fouseki, 2018), often times resulting in an uneven distribution of social and economic benefits that favour developers and the local government while exclude local communities (Zhao et al., 2020). Tosun (2000) argues that operational, structural, and cultural barriers inhibit community involvement in tourism development strategies, especially in small, developing towns. Tight local and national budgets for community participation typically contrast with the excessive cost of implementing extensive community participation processes. Furthermore, the development of heritage urban plans requires specific technical planning knowledge, which is often lacking locally. Foreign technocrats, working with minimal legal requirements for participation, may marginalise the views of local communities, and centralised public administration can also strip the local population of its authority, leading to the prioritisation of non-local objectives over local communities' concerns. There are also methodological barriers preventing effective local community engagement, as qualitative participatory approaches that allow meaningful participant engagement and feedback regarding proposed built environment changes can be too expensive to be conducted at a large scale (Wondirad et al., 2020). These participatory approaches are also criticised for their selection bias, potentially favouring those with stronger voices and the means and availability to participate (Ashley et al., 2015; Dragouni & Fouseki, 2018). Furthermore, the community positions that are ultimately included in an urban plan remain subject to planners' interpretation of data.

Quantitative methods complement qualitative research, facilitating access to a wider and more representative sample at a lower cost, with statistical analysis reducing interpretation bias. However, the limited availability of secondary data on people's opinions, and a lack of details regarding the built environment, hinder planners from drawing substantive urban planning conclusions. This is particularly problematic when dealing with an issue as personal and fundamental as a place's perceived authenticity. Tools such as mail-back questionnaires to stakeholders (Byrd et al., 2009; Oktay, 2002) or a feasibility analysis including a systematic stakeholder analysis (Currie et al., 2009) can help planners to gather many participants and present them with questions regarding authenticity. However, participants may struggle to realistically imagine the impact of abstract urban planning regulations, and studies can be too expensive to implement in small towns of the developing world (Dragouni & Fouseki, 2018). Moreover, these methods are not able to deal with the many potential confounding factors (Angrist & Pischke 2009). It is therefore necessary to investigate robust participatory approaches that help people to clearly visualise the consequences of heritage urban planning regulation and allow a large cohort of stakeholders to express their opinions about a place's authenticity (Bandarin & Van Oers, 2012; Bond et al., 2004; Nijkamp & Riganti, 2008).

3. Methodology

3.1. Case study

We test whether a low-cost randomised control trial (RCT) strategy using image simulations can form an effective part of a real participatory process when defining planning regulations aimed at preserving a small town's image.

On the island of Chiloé, unique heritage wooden architecture, and a distinct culture, combined with a new airport connected to the nation's capital, have turned its small towns into touristic hotspots for domestic and international visitors. However, pressure for new retail and accommodation infrastructure has led to rapid and controversial built environment transformations, such as the Castro Mall: a six-level, 300,000-square-metre retail complex in a modern style, inserted between small two-storey wooden houses, which now dominates the view of the town of Castro.

Our study focuses on the historic centre of the town of Chonchi, located in the Calle Centenario heritage zone, known for its early-20th-century wooden houses. These houses were built using cypress wood during an economic boom, supplying electricity posts for Chile and Peru. Chonchi, like several small towns on Chiloé, is facing significant changes in its built environment due to a weak regulatory framework, and can thus be taken as a relevant case study of small historic towns across the island. Although the city has generic urban planning regulations around factors such as building height, density, land use and minimum land division, there are no specific heritage regulations that address the unique local building styles. To run this study, we partnered with a planning firm used for consultancy in the development of an urban planning regulation proposal for the Chonchi Historic Centre. Proposals modelled and tested in this study were proposed following a series of participatory qualitative workshops developed by the firm.

3.2. Photo simulations

Photo simulation is a research technique widely used in urban planning and environmental psychology, and involves editing photographs to modify various aspects of the visual environment presented, which are then used to measure perceptions, attitudes, and emotions. Research has shown that viewing images can induce emotional physiological states and physiological body responses associated with positive and negative emotions, such as heart rate, sweating, hormonal rates and psychometric scoring (Chirico et al., 2017; Hedblom et al., 2019a; Kreibitz, 2010; Yu et al., 2018). Furthermore, studies in neuropsychology have demonstrated a link between viewing urban and rural images and the activation of brain regions associated with emotions including fear (amygdala) and happiness (putamen). Photo simulation research has been used to investigate the impact of urban environments, with studies conducted on residents' preferences for local commercial areas (Sullivan & Lovell, 2006), residential density (Navarrete-Hernandez, Lunecke, Truffello, & Fuentes, 2023), river restoration (Junker & Buchecker, 2008), greener streets and alleyways (Jiang et al., 2017, 2019; Jorgensen et al., 2002; Navarrete-Hernandez & Laffan, 2019, 2023), building density (Navarrete-Hernandez et al., 2021) and feelings of attachment to home (Cerin et al., 2016). Our study here draws on photo simulation as a reliable method to simulate different planning regulation scenarios and measure their impact on people's perceptions of town identity.

3.3. Study design

Our RCT study involved 104 participants and was carried out in August 2018 in Chonchi, Chiloé. Participants viewed photo-simulated images of building development in Chonchi, which were divided into: (1) control images, with traditional Chonchi architectural elements in place (i.e. a scenario in which additional heritage regulations have been introduced), referred to henceforth as the 'regulated' scenario; and (2) treatment images, in which heritage features are not retained (i.e. a scenario following the current planning context with no additional heritage regulations), referred to as the 'unregulated' scenario. Participants then rated how well the presented urban image reflected Chonchi's visual identity.

Since our objective here is to assess the suitability of our proposed photo-simulation RCT method in a real-life heritage planning process, we base our model on heritage planning regulations proposed by a

consultancy firm following a series of participatory qualitative workshops involving residents, professional organisations and public officers. The proposal introduces eleven building-level regulations, which are divided into two categories representing the central elements of Chonchi's architectural tradition: building form and building details (see Fig. 1). The regulations around building form oblige developers to construct terraced housing, without front gardens, and with octagonal corners, simple building shapes, a front-facing roof and traditional canopies above sidewalks. Building detail regulations enforce the use of wooden tiles on façades, unpainted natural wood finishes, bare steel roofs, wooden windows frames and wooden painted advertisements for shops and retail.

Photographs were taken of recent building developments in Chonchi that did not adhere to these proposals, and photo simulations were then made to simulate the buildings as though the regulatory restrictions had been incorporated into their design. Each proposed regulation was simulated separately, and multiple treatments were used for the most prevalent design elements (for instance, the most common façade materials or roof colours) to reflect the variety of building development in Chonchi.

3.4. Sampling method

The data was collected by trained surveyors over the period of August 16–24, 2018. Participants were approached when walking in the town centre and were asked to take part in a 5-min survey to help understand the identity of the Chonchi built environment. Participants used a tablet to sign an online consent form and answer socioeconomic questions and then used the online platform Urban Experiment (www.urban-experiment.com) to rate eleven randomly assigned images according to how well they represent Chonchi's identity on a ten-point scale, from 1 (not at all) 10 (completely). A dual randomisation process ensured a balanced allocation of covariates between control and treatment images in the experiment. The order of appearance of the eleven regulation types was randomised, to control for any potential bias arising from participants' spillover effects, or fatigue from rating several images. Then, we randomised the appearance of control and treatment images within each regulation type. Finally, we ensured comparable control and treatment groups by running balance tests on age, gender, municipality, and parental status for each image category.

3.5. Data set

We draw from three sources of data: 1) ratings of perceived *Chonchina* identity for images; 2) participants' socioeconomic characteristics; and 3) experimental conditions. The first is our dependent variable of participants' declared perception of *Chonchina* identity on a 1 to 10 scale for each presented image. For the second, participants indicated their age, gender, residence, and whether they had children. For the third, we collected the experimental conditions of treatment status, an image's order of appearance, and the date of response.

3.6. Empirical strategy

We use a random intercept model with fixed effects at the image level to test impacts. Random intercepts account for participants' pre-existing *Chonchina* identity considerations.¹ Fixed effects are used to control for each image having a unique identity rating. The model is as follows:

¹ Each participant rated a series of images on a scale from 1 to 10. We anticipated that the ratings of images from the same individual would be more similar than those from different participants. Therefore, we incorporated a random intercept model, allowing our model the flexibility to accommodate multiple regression lines. This accounts for the clustering at the individual level in our data and minimises this issue.

$$Identity_{ij} = \beta_1 Treatment_i + \beta_2 Image_i + U_j + E_{ij} \quad (1)$$

where $Identity_{ij}$ is the declared *Chonchina* identity perception of participant j for image i ; $Treatment$ is a variable equal to 0 if the presented image is a control, 1 if it is treatment 1, 2 if it is treatment 2 and 3 if treatment 3; β_1 is our coefficient of interest containing the impact of a regulation scenario on participants' reported perception of identity; $Image_i$ is an image fixed effect for the i th image; U_j is the random intercept associated with the j th individual; and E_{ij} is the error term. We check the robustness of our estimates by running Eq. (1) without and with controls (age, gender, municipality, parental status, image order, and date of the test). The basic assumption here is that, if the control and treatment scenarios are comparable across all observable and unobservable covariates, estimations should not change considerably.

4. Results

We examine the effects found in the study by interpreting the findings following two directions of inquiry. First, we aim to discern the overall impact of the different regulatory scenarios on participants' perceptions of *Chonchina* identity, and second, we explore the need to regulate specific aspects of the built environment.

4.1. Overall impact on the participants

We first consider the overall impact of an unregulated heritage scenario (only generic urban planning regulations around factors such as building height, density, land use and minimum land division) on perceptions of *Chonchina* identity. Fig. 1A shows that this scenario allows transformations to the built environment that significantly reduce perceived *Chonchina* identity (estimate = -1.27 , S.D. = 0.32 , $p < 0.01$). This supplies robust evidence to justify further heritage regulation to preserve a town's image and touristic appeal.

4.1.1. General findings by participant characteristics

We analysed the impact of an unregulated scenario for different participant characteristics. Fig. 2A shows a similar decrease in the perception of *Chonchina* identity for both men and women. (Men-estimation = -1.30 , S.D. = 0.53 , $p < 0.05$; Women-estimation = -1.23 , S.D. = 0.39 , $p < 0.01$).

Next, we examine results by three age groups: under 30, 31–50, and over 50. Fig. 2B indicates that, in an unregulated scenario, perceived identity decreases more for younger than for older populations, and is significant only for the groups under 30 years of age (estimate = -2.09 , S.D. = 0.57 , $p = 0.001$) and aged 31–50 (estimate = -1.28 , S.D. = 0.51 , $p = 0.05$). The results show that age impacts attitudes toward identity and heritage planning regulations.

Fig. 2D further shows that an unregulated scenario significantly decreases the town's perceived identity both for families with children (estimate = -1.04 , S.D. = 0.42 , $p < 0.05$) and without (estimate = -1.85 , S.D. = 0.50 , $p < 0.01$), but with a larger negative impact for the latter group.

Given that our starting point for this study was Chonchi's status as a growing tourism hub, we then analyse how participants' residency conditions influence the results. Fig. 2C shows that an unregulated scenario has a negative impact on perceived identity for both groups, however, the decrease is significantly larger for non-locals (estimate = -3.07 , S.D. = 0.77 , $p < 0.01$) than for locals (estimate = -0.65 , S.D. = 0.35 , $p < 0.1$). All the sociodemographic results presented above remain robust to the incorporation of controls, as shown in Tables 2.A–D (see Appendix). This reveals that Chonchi's attractiveness from a tourist perspective can be considerably affected under an unregulated planning scenario.

Although we do find that sociodemographic factors affect how Chonchi is perceived, we also note that most population groups saw a

A. Building Form



Fig. 1. Photographic simulations.

significant decline in perceived *Chonchina* identity in an unregulated planning scenario. Overall, we conclude that at least some forms of stricter planning regulations are required to preserve a town’s identity. This will be explored in the following section.

4.2. Findings by type of intervention

As noted above, we divided the built environment regulations into two broad categories: building form and building details. Fig. 3A-B

shows that an unregulated scenario decreases the town’s perceived identity for both categories, but with a significant impact only for building details (estimate = −0.98, S.D. = 0.36, p = 0.051). In other words, this suggests that, at a minimum, strict regulations around the details and finishes of traditional buildings are necessary to preserve local identity.

4.2.1. Individual regulations (building form)

We further analyse the impacts for each proposed regulation, starting

B. Building Details



Fig. 1. (continued).

first with those in the building form category (see Fig. 1, panels A.1 to A.6). This includes six types of regulation: housing type, front garden, corner shape, building volume, roof orientation, and façade canopy. Fig. 3C-H shows negative estimates for perceived identity when comparing an unregulated to a regulated scenario, however, none are significant. Results are robust to the addition of controls (see Table 3 in Appendix).

4.2.2. Individual regulations (building details)

Fig. 3.I-L shows the effects of the five regulations of the building details category: façade material, façade paint, roof colour, window frames, and advertising (see Fig. 1, panels B.1 to B.5). The results show that the effect of an unregulated approach to building details is fairly consistent across the different regulation types. All façade materials that depart from the traditional wooden shingle style significantly reduce the perceived identity of the town (corrugated zinc-estimate = −2.99, S.D.

= 0.57, $p < 0.01$; plastic plank-estimate = −2.55, S.D. = 0.54, $p < 0.01$; wooden plank-estimate = −1.24, S.D. = 0.47, $p < 0.01$), although the reduction for the wooden plank style (i.e. using the same traditional material, but in a different style) is less pronounced. When choosing colours for the exterior, any deviation from the wooden appearance is negatively viewed, especially with primary-colour paint (estimate = −1.34, S.D. = 0.53, $p < 0.05$). A slightly significant decrease is observed for painting roofs in primary colours (estimate = −0.76, S.D. = 0.42, $p < 0.1$) and removing window frames (estimate = −0.78, S.D. = 0.42, $p < 0.1$). The addition of controls strengthens the significance of these results (see Table 3 in the Appendix). While regulating shopfront advertising has a minor impact on perceived identity, this disappears with the addition of controls. Overall, a regulatory approach that at least incorporates stringent regulation around building details can provide an important step in preserving the image identity e of the town of Chonchi.

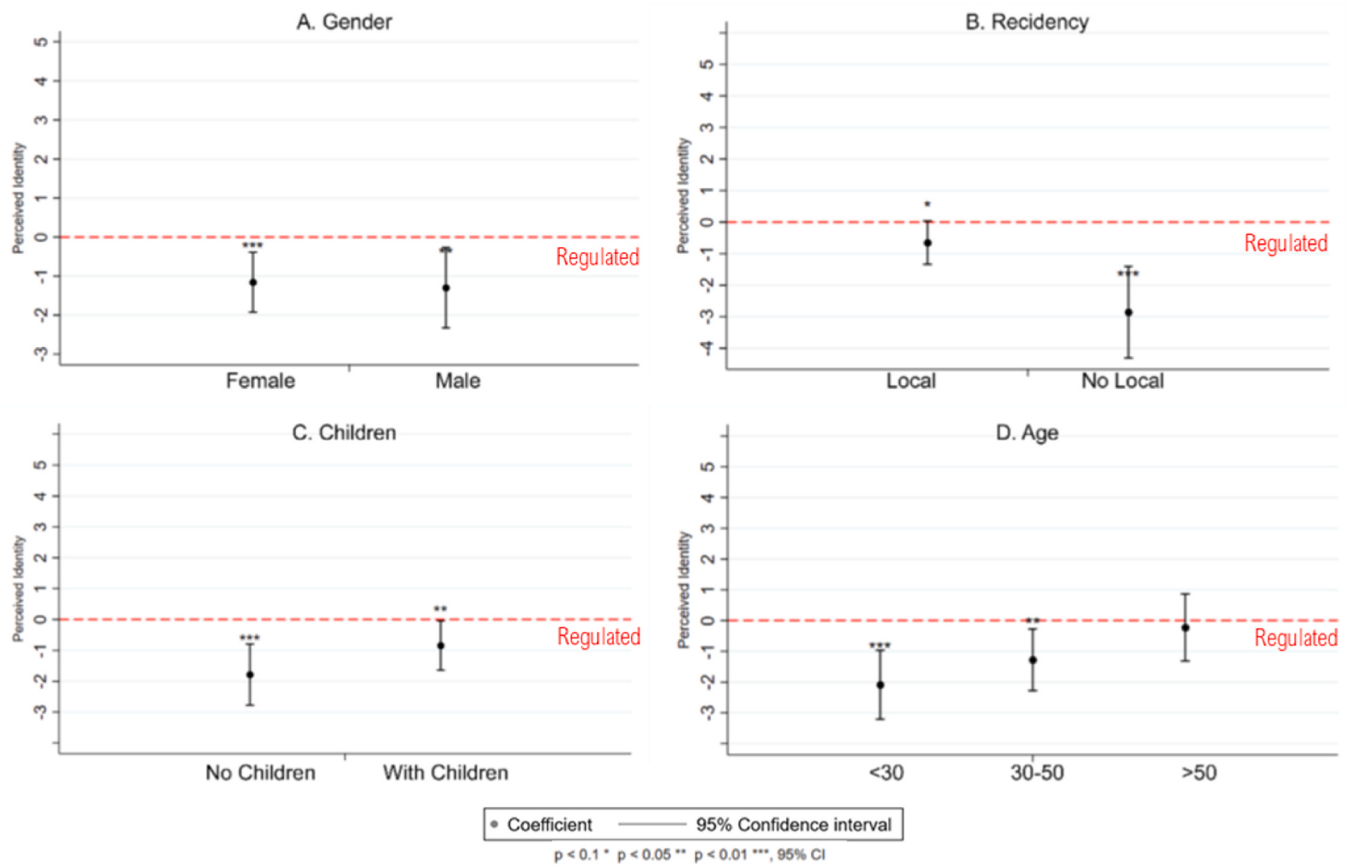


Fig. 2. Perceptions of Chonchina identity in an unregulated scenario (by participant characteristics).

5. Discussion

Our research has examined a novel planning approach to test how urban heritage regulations affect people's perceptions of a small town's visual identity. By photo-simulating building construction under the presence or absence of heritage planning regulations, we have determined their impact on the town's perceived identity, a relevant factor affecting long-term touristic visits. We found that a large part of a town's identity, and therefore its attractiveness, can be preserved by implementing a range of minimum regulatory conditions, namely basic restrictions around the form and size of buildings, and more stringent restrictions around traditional building details. Overall, our method has allowed us to identify the central points of distinction for a town, whose inclusion in heritage urban plans are essential to developing a long-term tourism plan that preserves the local image, and whose neglect would result in a deterioration in the identity of the built environment. Our findings demonstrate the crucial need to maintain a place's authenticity by preserving the specificities of urban environments that are all too often ignored in urban planning.

5.1. Main findings

5.1.1. Heritage regulations effectively preserve a town's identity

Our broadest finding underlines that the absence of heritage-specific regulation permits construction that effectively damages a town's visual identity. This is observable across different demographics, although some population groups are more affected. We found no difference across gender or between locals and visitors, however participants without children and young people perceive more strongly adverse effects. On a practical level, this suggests that developing and implementing heritage regulations in small towns undergoing rapid change to

their built environment is both an effective and urgently needed strategy to preserve the town's identity and, as a consequence, its touristic appeal. On a methodological level, these findings demonstrate the ability of our image-based RCT methodology to capture important differences amongst a population, which can then be integrated into discussions around conservation regulations. On a theoretical level, the findings suggest that sociodemographic characteristics do play a significant role in the perception of a town's identity, and therefore traditional qualitative participatory processes might emphasise the views of those that have the skills, time and resources to participate and make their voice heard. Urban heritage plans should therefore strive to include as diverse communities as possible, to reflect these different perspectives.

5.1.2. An approach that identifies key heritage regulations to preserve a town's identity

In the case of Chonchi, our study suggests that current planning regulations that do not protect traditional building characteristics allow for development that negatively affects local identity. We see no significant impact when applying more lenient regulations around the form of buildings, however deregulation around finer details has a strong negative effect.

A town's authenticity is unique, and thus the impact of heritage regulations around the built environment should capture its distinctive architectural features. Chonchi is a town with a historical use of native wood as a primary construction material, and so it seems reasonable that finer details and construction materials would be central to the town's visual identity, while throughout most of the town's history, overall building form was unrestricted and reflected the diverse needs and means of each building owner, and is thus a less distinctive feature. Our results seem to reflect this history, with the maintenance of traditional façades (in the case of Chonchi, wooden shingle), regulation of colour

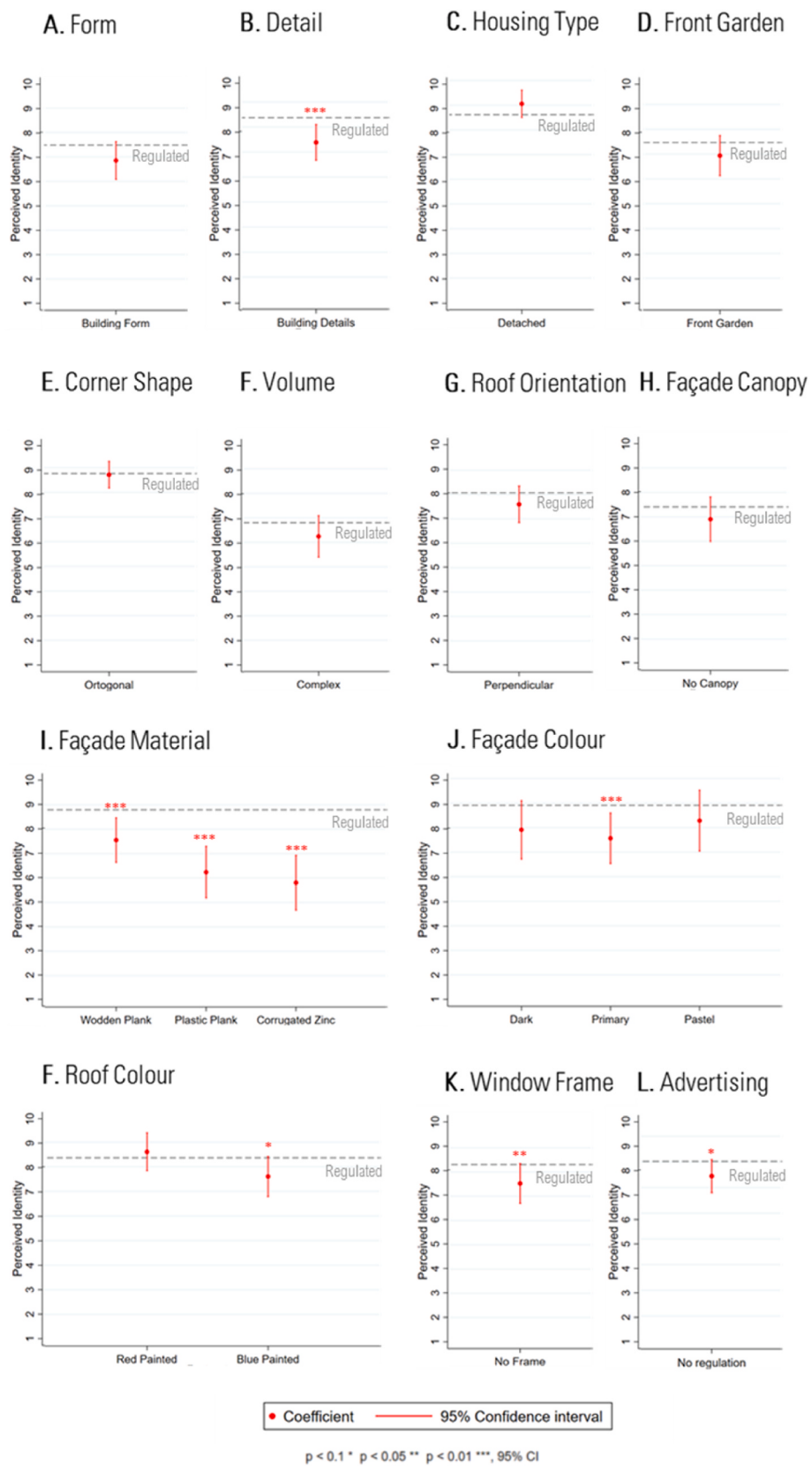


Fig. 3. Perceptions of Chonchina identity by type of regulation.

palettes (particularly natural wood), and the preservation of traditional wood window frame styles being central factors in preserving Chonchi's unique visual appeal.

By their nature, built environment traditions differ from town to town, and so other locations might identify different regulation needs. It is worth noting that we do not conclude here that regulations around building details are universally more pertinent than those around building form, and we recognise that other locations may see an inverse relationship, or indeed both aspects may be equally relevant. We do however advocate that the widespread absence of heritage-specific regulatory frameworks across historic small towns in the Global South is likely to result in eroding their authenticity and therefore the basis of their touristic appeal. We therefore present this image-based RCT approach as a flexible method of identifying location-specific regulations to preserve a built environment's identity, requiring minimal technical and resource inputs, and being easily accessible for small towns in the Global South.

5.1.3. Image-based RCT as a complement to traditional heritage planning

We present these methods not as a replacement of traditional qualitative participatory planning for towns with heritage value, but rather as a complement to these processes. Qualitative participatory processes are essential for hearing people's voices and to build agreement on what needs to be regulated. Therefore, as is the case in this study, the views from both locals and experts can provide an informed selection of the regulations that are most relevant for testing via this method. The photo-simulation and testing of these proposed regulations with a wider population allows for a scientific assessment of their impact prior to implementation, informing decisions through robust evidence and reducing the risk of over- or under-regulation.

As heritage development plans move from expert-driven planning methods to more pluralistic and democratic approaches (Ashworth & Tunbridge, 1999; Foroudi et al., 2020; Kosma, 2014; Lopez Sanchez, 2020) the image-based experiment presented here can help to better incorporate the views of diverse communities. This method allows citizens to clearly envision scenarios of deterioration, as well as alternatives for improvement, via a game-like method that facilitates people's choices and helps to raise community awareness of heritage preservation. Compared with community workshop and expert advice, this approach facilitates the collection of large samples via less time-consuming methods, allowing for broader and more diverse participation. Furthermore, these large-scale RCT participatory processes can reduce respondent biases and allow decisions to be based on causal evidence of the impact of heritage regulation on a town's identity for different stakeholders. In turn, this approach might help us to recognise the different perspectives present, build community-developer consensus over the minimum regulations necessary to preserve a town's identity (Lopez Sanchez, 2020), and defend the common interest over the long-term development of local tourism.

5.1.4. Limitations

This study however does have limitations. Our findings correspond to a randomly assigned survey of passers-by within the town of Chonchi over two weekends in August. Thus, this study reflects attitudes during the low winter season, which subsequently means that the results cannot necessarily be expanded to accommodate attitudes in the summer. While there is no immediate reason to believe that the recorded results would differ during different seasons, it is important to examine whether responses to photo simulations might be influenced by climatic conditions and different tourist demographics present across at different times.

A further consideration is the spatial representation of the regulatory framework being tested. While the focus of this study is built environment regulations that affect whole neighbourhoods, the results are strictly linked to the spatial perception of a small segment of a street comprising only one single or a few buildings. It is possible then that the

results may vary with aggregation and may be different in the case of transformation of larger urban areas. This could be addressed by modifying the assessed images with wider perspectives, while still maintaining the RCT framework. Moreover, we test only a reduced number of heritage regulations from a very large universe of possibilities, meaning that there may be other regulations that could prove more effective for preserving identity. Furthermore, the alternatives tested do not incorporate the full spectrum of existing construction styles in Chonchi. This is largely due to the number of photo-simulations that would be necessary to address all the nuances of local buildings, for instance the varied façade colours or building sizes. Finally, this strategy does not account for buildings that might emerge in the future, for instance the impact of increased use of concrete or glass for façades in an unregulated context.

A final restriction of the study is its reliance on visual stimuli. It has been shown that aural sense is important in urban perception, although vision remains the dominant sense in terms of spatial perception (Welch & Warren, 1980; 1986; Shimojo & Shams, 2001). While VR or video technology would allow for a more immersive urban experience that reproduces both visual and auditory stimuli, we opted for photo-simulations as our preferred method, as they present a relatively affordable and simple approach that can be easily adapted to the context of a small town in the Global South. Furthermore, image-based methods have been widely used in environmental psychology to study preferences and emotions in the built environment and are an effective tool commonly used by urban planners and designers in participatory decision-making processes. Thus, this method remains a simple, affordable, familiar and reliable means to evaluate how regulatory frameworks affect perceived identity.

6. Concluding statement

Finding the right urban planning regulations to accommodate rapid built environment transformation while preserving the identity of a small town with significant cultural heritage is a complicated task, typically falling on under-resourced local urban planning departments. This requires a delicate regulatory equilibrium, where investment and local growth are not hindered by an overly restrictive urban plan, but the appeal of a town is also not compromised. Our study has presented a low-cost and rapid image-based RCT that can be used to establish a minimum regulatory framework to reach this equilibrium. We have implemented and shown the effectiveness of this methodology using a real-life planning regulation process for the preservation of a historic small-town identity in the Global South. Using this tool, we have been able to identify the areas in which a lack of heritage regulations would significantly damage the town's identity, and from this, we are able to set a minimum necessary regulatory approach. The methods also show sensitivity to relevant sociodemographic characteristics including gender and age, while demonstrating that locals and non-locals appear to value similar aspects of Chonchi. The method is further able to provide a baseline for policies of urban regeneration that can be accommodated without significantly compromising a town's historic identity.

Moving forward, our technique could be adapted for use in many urban planning processes in developing countries, allowing local planners to determine what must be preserved, and what can be changed, to conserve a place's identity without undermining its development. Despite its limitations, an image-based RCT, through its simplicity, flexibility, and affordability, offers to researchers and practitioners a valuable strategy to evaluate scenarios of heritage built environment regulations.

CRedit authorship contribution statement

Pablo Navarrete-Hernandez: Conceptualization, Data curation, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review

& editing. **Juan Pablo Urrutia:** Writing – original draft, Writing – review & editing. **Kaoutar Mellouki:** Writing – original draft, Writing – review & editing.

Declaration of competing interest

Us, Pablo Navarrete Hernandez, Juan Pablo Urrutia and Kaoutar Mellouki, declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work in this paper. Also, we declare that there are no financial interests/

personal relationships which may be considered as potential competing interests.

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APPENDICES.

Table 1
Perceptions of Chonchi's identity in regulated and unregulated scenarios

VARIABLES	Overall	
	1	2
Unregulated	−1.27*** (0.32)	−1.32*** (0.33)
Constant	8.03*** (0.21)	−288.53 (194.50)
Controls	No	Yes
Observations	1375	1375
Number of groups	109	109

Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

Table 2
Perceptions of Chonchi's identity in regulated and unregulated scenarios (by participants' characteristics)

2.A Gender						
VARIABLES	Female		Male			
	1	2	3	4		
Unregulated	−1.23*** (0.39)	−1.22*** (0.40)	−1.30** (0.53)	−1.55*** (0.55)		
Controls	No	Yes	No	Yes		
Constant	7.97*** (0.31)	−393.32 (287.98)	8.09*** (0.30)	−209.21 (237.17)		
Observations	715	715	660	660		
Number of groups	58	58	51	51		
2.B Age						
VARIABLES	Under 30		31–50		Over 50	
	1	2	3	4	5	6
Unregulated	−2.09*** (0.57)	−1.97*** (0.54)	−1.28** (0.51)	−1.30*** (0.50)	−0.35 (0.55)	−0.43 (0.59)
Control	No	Yes	No	Yes	No	Yes
Constant	8.62*** (0.27)	−397.80 (321.77)	8.03*** (0.36)	225.27 (285.00)	7.40*** (0.42)	−597.99** (262.06)
Observations	462	462	484	484	429	429
Number of groups	39	39	37	37	33	33
2.C Residence						
VARIABLES	Local			Non-Local		
	1	2		3	4	
Unregulated	−0.65* (0.35)		−0.63* (0.35)		−3.07*** (0.77)	−3.34*** (0.65)
Controls	No		Yes		No	Yes

(continued on next page)

Table 2 (continued)

2.C Residence				
VARIABLES	Local		Non-Local	
	1	2	3	4
Constant	7.74*** (0.25)	−318.49 (241.13)	8.99*** (0.35)	−175.27 (300.15)
Observations	1100	1100	275	275
Number of groups	89	89	20	20
2.D Having a Child				
VARIABLES	Local		Non-Local	
	1	2	3	4
Unregulated	−0.65* (0.35)	−0.63* (0.35)	−3.07*** (0.77)	−3.34*** (0.65)
Controls	No	Yes	No	Yes
Constant	7.74*** (0.25)	−318.49 (241.13)	8.99*** (0.35)	−175.27 (300.15)
Observations	1100	1100	275	275
Number of groups	89	89	20	20

Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

Table 3

Perceptions of Chonchi's identity by type of regulation

VARIABLES	Volume		Continuous Façade		Front Garden		Corner Shape	
	1	2	3	4	5	6	7	8
Unregulated								
Treatment 1	−0.56 (0.43)	−0.39 (0.44)	0.44 (0.28)	0.25 (0.25)	−0.53 (0.41)	−0.40 (0.41)	−0.05 (0.28)	−0.05 (0.31)
Treatment 2								
Treatment 3								
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Constant	6.80*** (0.25)	−776.85** (354.43)	8.61*** (0.20)	−553.62** (281.21)	7.47*** (0.27)	−593.04 (422.98)	8.76*** (0.21)	−98.97 (275.58)
Observations	125	125	125	125	125	125	125	125
Number of groups	109	109	109	109	109	109	109	109
VARIABLES	Roof Orientation		Roof Colour		Façade Canopy		Façade Material	
	9	10	11	12	13	14	15	16
Unregulated								
Treatment 1	−0.47 (0.38)	−0.59 (0.41)	0.24 (0.39)	−0.01 (0.43)	−0.51 (0.46)	−0.29 (0.44)	−1.24*** (0.47)	−1.44*** (0.47)
Treatment 2			−0.76* (0.42)	−0.92** (0.46)			−2.55*** (0.54)	−3.20*** (0.55)
Treatment 3							−2.99*** (0.57)	−3.29*** (0.56)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Constant	8.07*** (0.24)	−372.29 (297.65)	8.36*** (0.34)	−516.19* (278.98)	7.41*** (0.35)	−257.61 (412.51)	8.79*** (0.25)	497.24 (339.28)
Observations	125	125	125	125	125	125	125	125
Number of groups	109	109	109	109	109	109	109	109
VARIABLES	Façade Colour		Window Frame		Shop Publicity			
	17	18	19	20	21	22		
Unregulated								
Treatment 1	−1.00 (0.61)	−0.74 (0.60)	−0.85** (0.42)	−0.81** (0.40)	−0.58* (0.33)	−0.52 (0.33)		
Treatment 2	−1.34** (0.53)	−1.27** (0.51)						
Treatment 3	−0.62 (0.63)	−0.65 (0.70)						

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Table 3 (continued)

VARIABLES	Façade Colour		Window Frame		Shop Publicity	
	17	18	19	20	21	22
Controls	No	Yes	No	Yes	No	Yes
Constant	8.91*** (0.35)	−365.00 (389.37)	8.31*** (0.23)	−238.76 (330.64)	8.02*** (0.23)	−308.53 (280.81)
Observations	125	125	125	125	125	125
Number of groups	109	109	109	109	109	109

Robust standard errors in parentheses.

***p < 0.01, **p < 0.05, *p < 0.1.

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