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EMPIRICAL PAPERS

Understanding Policy Acceptance Through UTAUT-2: The Case of the Northbound Travel Policy for Macau Vehicles

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Understanding how people embrace and adopt new regulations is crucial in today's rapidly changing world. This study presents a fresh perspective by applying the Unified Theory of Acceptance and Use of Technology 2 (UTAUT-2) to investigate policy acceptance, and to validate a fundamental model for future research. More precisely, we employ the UTAUT-2 framework to examine how Macau residents perceive the "Northbound Travel for Macau Vehicles" policy, which permits vehicles with Macau registration plates to enter mainland China through the Hong Kong-Zhuhai-Macau Bridge. Utilizing structural equation modeling software (SmartPLS), we analyze data collected from respondents who have experience with the new regulation. Our findings demonstrate that Performance Expectancy (PE) and Habit (HB) significantly influence individuals' intention to utilize the policy. Essentially, individuals are more inclined to embrace policies they perceive as advantageous and in line with their existing habits. Effort Expectancy (EE) and Facilitating Conditions (FC) did not significantly affect acceptance, possibly because participants were already familiar with the regulation and had sufficient resources available. Notably, while not directly linked to usage, Social Influence (SI) exhibited a high mean value, suggesting its potential role in policy acceptance when significant others adopt the policy. This pioneering research bridges the gap between technology acceptance models and policy studies, providing a comprehensive framework for evaluating acceptance factors in an evolving regulatory environment.

1. Introduction

Technology has revolutionized the way we live, work, and interact with others, becoming an integral part of our daily lives. However, studies have shown that new ideas are difficult to accept even if they have obvious advantages (Rogers, 2003), and, in practice, new ideas take a long time to be fully embraced. Similarly, the implementation of public policies faces significant challenges in terms of acceptance and effective use, as individuals often resist adhering to changes that impede on their established routines. It is like a city planner making a change to the direction in which cars travel on a specific street; the decision may be unpopular at first, but eventually, people learn to accept the decision.

While a large amount of work has been conducted in the technology field (Venkatesh et al., 2012) there are significant gaps in our understanding of public policy acceptance (Hudson et al., 2019). New models are, therefore, necessary to test the recipients' acceptance of innovative policies. To fill the gap in the literature, it is proposed that a framework that assesses the acceptance of technology can be adapted to examine the acceptance of public policies. More precisely, the Unified Theory of Acceptance and Use of Technology 2 (UTAUT-2) was adapted to capture the nuances of policy acceptance related to the recently introduced policy in Macau SAR (China) known as "Northbound Travel for Macau Vehicles" (Government Information Bureau (GCS), 2022).

Launched in January 2023, the policy aims to enhance connectivity within the Guangdong-Hong Kong-Macao Greater Bay Area. With the approval of pre-arranged customs clearance, vehicles with Macau registration plates can enter Guangdong directly through the Hong Kong-Zhuhai-Macau Bridge. The new procedure replaces the previous stringent requirement of obtaining a double license plate to enter the mainland, to create new opportunities for Macau residents in the development of the Guangdong-Hong Kong-Macau Greater Bay Area (GBA) and support Macau's integration into the overall national development plan. As a result of this policy, Macau residents are expected to have easier access to the mainland for short-term business trips, study, work, and travel (Macau Daily Times, 2022, December 21). Reportedly, there was a strong demand for driving into the mainland. In 2023, the total clearance volume of Macau inbound and outbound passenger vehicles through the bridge exceeded 1.4 million, corresponding to a more than 35% increase in cross-border traffic year-on-year (Chinadailyhk, 2024, January 3). Thus, this paper has implications for local authorities and researchers interested in assessing and improving the adoption of public policies. Overall, it contributes to an improved understanding of public policy acceptance and provides policymakers with insights on enhancing their implementation.

2. Literature Review

2.1. Review of policy acceptance frameworks

Various frameworks have emerged to study policy acceptance and implementation. These frameworks aimed to explain the factors contributing to successful policy implementation and to pinpoint potential hurdles.

Saglie (1996) researched Norwegian alcohol policy, examining how individual preferences influence public policy. Sang and Lee (2009) explored a Conceptual Model of e-Government Acceptance in the Public Sector, integrating constructs from various models to explain government officers' acceptance of e-Government services. PytlikZillig et al. (2018) focused on identifying factors predicting willingness to accept and support policy decisions in "Deliberative Public Engagement with Science," developing constructs to explain process perceptions and attitude coherence. Hu et

al. (2021) investigated Mainland China's free independent travelers (FIT) scheme, evaluating Macau residents' perceptions and attitude formation regarding the policy. Pierce (2014) extended the Technology Acceptance Model to analyze the acceptance of new policy implementation in his doctoral dissertation, emphasizing perceived usefulness and perceived ease of use in the Policy Acceptance Model (PAM).

The designs of the Model of e-Government Acceptance in the Public Sector (Sang & Lee, 2009) and the PAM (Pierce, 2014) suggest that models initially developed for the technology domain can also elucidate policy acceptance. With this in mind, the subsequent sections will introduce the choice for the UTAUT-2 and our conceptual framework.

2.2. UTAUT Theoretical Framework

Theoretical frameworks serve as foundational lenses for understanding phenomena. Among these frameworks, the Unified Theory of Acceptance and Use of Technology 2 (UTAUT-2) (Venkatesh et al., 2012) is a theoretical model that helps researchers understand why people adopt or use innovations. It's based on the idea that several key factors influence a person's decision to accept and use innovations, such as performance expectancy, effort expectancy, social influence, facilitating conditions, price value, hedonic motivation, and habit. Generally, stronger constructs lead to stronger behavioral intentions to accept technology, and consequently, the usage behaviors. In this paper, new policies are conceptualized as innovations that prompt a particular behavior from the user, thus justifying the use of a technology model. At the time of writing the original papers, "User Acceptance of Information Technology: Toward a Unified View" (Venkatesh et al., 2003) and "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology" (Venkatesh et al., 2012) have been cited over 60,000 times altogether in various articles. The authors based the model on previous studies such as the Innovation Diffusion Theory (IDT) (Rogers, 2003), the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), the Technology Acceptance Model (TAM) (Davis, 1989), and the Theory of Planned Behavior (TPB) (Fishbein & Ajzen, 2011), among others. In our case, UTAUT represents an updated synthesis of existing technology acceptance research into a single framework that is also tested for policy acceptance. Based on the extensive research, meta-analysis, and validation of the model in different settings (Lampo, 2022; Tamilmani et al., 2021), an adapted UTAUT-2 is proposed to test acceptance in the policy context. The next section elucidates the development of our conceptual model.

3. Conceptual Model

To determine the applicability of the UTAUT-2 in the policy context, a preliminary exploratory study was conducted with three law practitioners. The study took a qualitative approach as the participants were asked a series of unstructured questions related to the proposed model, and invited to

Table 1. Definition of Constructs

Behavioral Intention	(BI)	The extent to which individuals intend to use a policy
Performance Expectancy	(PE)	The degree to which using a policy will provide benefits in performing certain activities.
Effort Expectancy	(EE)	The degree of ease associated with the individuals' use of the policy.
Social Influence	(SI)	The perception of how important others feel about a particular policy.
Facilitating Conditions	(FC)	People's perceptions of the resources and support available for using a policy.
Habit	(HB)	The perception of whether using a policy could become routine behavior.

Definitions adapted from Venkatesh et al. (2012).

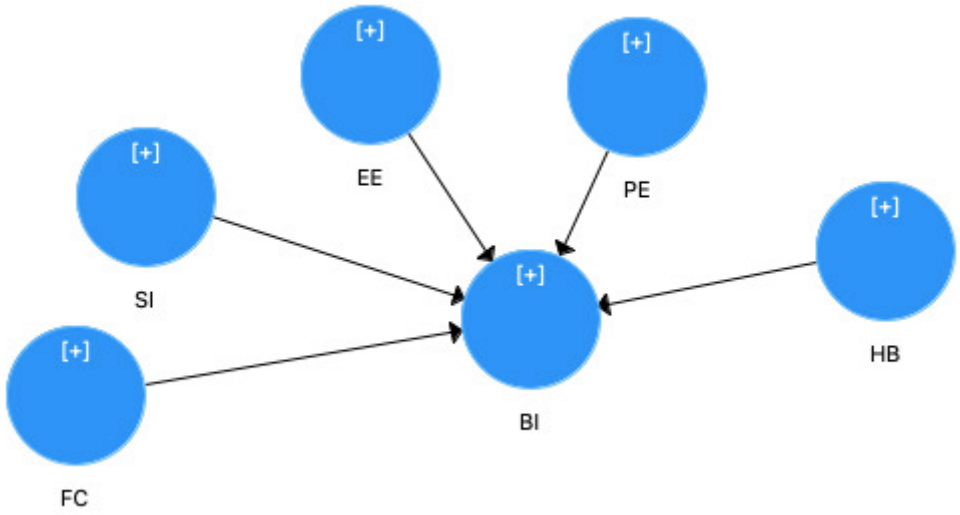

Figure 1. Conceptual Model (SmartPLS output).

comment on any element that they felt was important. The number of interviews was deemed sufficient for collecting contextual information as the interviewees' responses tended to converge. In particular, the discussion revealed that two predictors were not relevant to the context. As a result, it was decided to exclude the constructs of Price Value and Hedonic Motivation from our main study. As such, the conceptual model consists of five constructs (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, and Habit) that are theorized to positively affect the behavioral intention to use a policy. As a general rule, the stronger each construct, the greater the impact on the intention. According to the model, behavioral intention best predicts how the policy will be used in real-life situations. Each of the constructs is defined in Table 1.

According to the literature, each construct is expected to impact the behavioral intention to use a policy. The conceptual model is illustrated in Figure 1, followed by the list of our research hypotheses in Table 2

4. Methodology

Our study adopted a descriptive and cross-sectional design to explore the behavioral intention of local drivers to accept and use the "Northbound Travel for Macau Vehicles" policy. A self-administered survey with questions adapted from the UTAUT-2 was developed to assess policy acceptance. The

Table 2. Summary of Hypotheses

H1	A positive and significant relationship exists between Performance Expectancy (PE) and behavioral intention (BI)
H2	A positive and significant relationship exists between Effort Expectancy (EE) and behavioral intention (BI).
H3	A positive and significant relationship exists between Social Influence (SI) and behavioral intention (BI).
H4	A positive and significant relationship exists between Facilitating Conditions and behavioral intention (BI).
H5	A positive and significant relationship exists between Habit (HB) and behavioral intention (BI).

Hypotheses based on Venkatesh et al. (2012).

Table 3. Survey Items

Performance Expectancy (PE)	PE1	I find [the policy] is useful in my daily life
	PE2	Using [the policy] is beneficial to me
	PE3	Using [the policy] makes my life easier
Effort Expectancy (EE)	EE1	It's easy for me to learn how to use [the policy]
	EE2	[the policy] is clear and easy to understand
	EE3	[the policy] is easy to follow
	EE4	It is easy for me to become an expert in [the policy]
Facilitating Conditions (FC)	FC1	I have the resource necessary to use [the policy]
	FC2	I have the knowledge necessary to understand [the policy]
	FC3	[the policy] is compatible with my lifestyle
	FC4	I can get support if I have problems with [the policy]
Social Influence (SI)	SI1	People who are important to me would use [the policy]
	SI2	People who influence my behavior would think of using [the policy]
	SI3	people I value would think [the policy] is a good idea
Habit (HB)	HB1	The use of [the policy] could become a habit for me
	HB2	Using [the policy] may become a necessity for me.
	HB3	I feel I must use [the policy]
Behavioral Intention (BI)	BI1	I intend to use [the policy] in the near future
	BI2	I predict that I will use [the policy]
	BI3	I plan to use [the policy] soon

Survey items adapted from Venkatesh et al. (2012).

survey's items were measured by a 7-point Likert scale with anchors ranging from 1 (strongly disagree) to 7 (strongly agree) and consisted of 20 items grouped according to their latent variables. The following Table 3 reports the items used in our study.

The target population included Macau residents, aged 18 or above, who owned a car. The survey also included demographic variables to record the respondents' gender, age, and education. The survey was first developed in English and then translated into traditional Chinese using the back-translation technique (Son, 2018) to facilitate understanding.

To determine the minimum sample required to use structural equation modeling software such as SmartPLS, Hair et al. (2021) suggest using between 10 to 15 observations for each predictor, or using a dedicated tool. Consequently, GPower (Erdfelder et al., 1996) was used to determine the

minimum sample size for the study. Considering multiple regressions (.15 effect size, .05 probability error, .80 power, and five independent variables), the software estimated a minimum sample size of 92 cases.

Before the main study, a pilot test was conducted to identify potential issues. We distributed a preliminary survey to 10 university students and staff from a higher education institution in Macau. Although data from a student sample may not be representative of the real situation, it was relatively convenient to use this approach. This is because the main purpose was to explore the clarity of the questions, rather than the generalizability of the findings. Finally, the survey instrument was considered ready for the fieldwork, and the responses gathered in the pilot test were discarded.

The study adopted a convenience sampling technique under the assumption that the respondents were similar to the overall target population (J. F. Hair et al., 2008). Participants were initially selected from the researchers' network and then recruited by using the snowball method to collect responses in a short amount of time.

To ensure the sample was representative, efforts were made to contact a variety of participants whose vehicles had been approved by the government for travel to mainland China under the policy's regulations. The potential candidates were contacted by WeChat (a popular instant message tool) and then pointed at Google Forms, our surveying platform. In total 198 invitations were sent, and 136 valid and usable responses were collected, corresponding to a rate of 68,7%. This high response rate is attributed to the personal invitation and targeted approach. Participation was voluntary and no remuneration was offered for taking part in the survey. In addition to being informed of the purpose of the study, all the participants were assured that their answers were anonymous and that only aggregate data would be published.

5. Data Analysis and Results

5.1. Details of the Respondents

All respondents met the necessary condition of possessing a permit for cross-border travel. They were respectively males (62.50%; n=85) and females (37.50%; n=51). The majority of participants were between 25 and 40 of age (58.82%; n=80). Most respondents reported having either a bachelor's degree (28.77%; n=40) or a master's degree (22.05% n=30).

5.2. Evaluation of the PLS-SEM Results

We used Structural Equation Modeling (SEM) to test and validate the relationships between the variables in our model. Specifically, we employed SmartPLS 4 as a modeling package to conduct data analysis. This software enables researchers to input their data, test the relationships in the models, and evaluate the overall fit. We selected SmartPLS because it does not impose strict requirements about sample size and distribution assumptions, making it advantageous in certain situations (J. J. Hair et al., 2021). The preliminary

Table 4. Constructs reliability and validity

Construct	Items	Loadings	Cronbach's Alpha	rho_a	rho_c	AVE
Behavior Intention (BI)	BI1	0.950	0.921	0.921	0.95	0.864
	BI2	0.900				
	BI3	0.938				
Performance Expectancy (PE)	PE1	0.953	0.956	0.956	0.971	0.919
	PE2	0.971				
	PE3	0.952				
Effort Expectancy (EE)	EE1	0.916	0.914	0.916	0.946	0.853
	EE2	0.917				
	EE3	0.914				
	EE4	0.940				
Social Influence (SI)	SI1	0.902	0.897	0.898	0.936	0.829
	SI2	0.922				
	SI3	0.907				
Facilitating Conditions (FC)	FC1	0.641	0.777	0.923	0.848	0.586
	FC2	0.762				
	FC3	0.889				
	FC4	0.749				
Habit (HB)	HB1	0.953	0.946	0.947	0.965	0.902
	HB2	0.956				
	HB3	0.941				

Evaluation criteria: Loadings >0.70; Cronbach's Alpha: >0.70; Rho_a: >0.70; Rho_c: >0.70; AVE: >0.50.

analysis established that the PLS algorithm was not affected by issues related to missing data, outliers, non-normality, and multicollinearity. A first look at the results showed that the model explained 76.3% (R^2 = 0.763) of BI's variance and that the constructs EE, FC, and SI did not appear as determinants of policy use. However, to interpret these findings correctly the measurements model and structural model must be assessed (Garson, 2016). Accordingly, our data were first tested for constructs' reliability, validity, and discriminant validity to determine whether the indicators of each construct measured the same underlying concept and were different from the other constructs in the model. Table 4 presents the reliability and validity of the constructs.

Discriminant validity was assessed by using the heterotrait-monotrait (HTMT) ratio of correlations, which is the preferred method in PLS-SEM (J. J. Hair et al., 2021). Each value was below the conservative threshold of 0.85. As a result, there was a significant difference between the constructs in our model. The following Table 5 reports the HTMT results.

As all results met the recommended thresholds, the measurements model was successfully evaluated, and the structural model could be analyzed next. As reported earlier, our model explained 76.3% of the dependent variable BI. A closer examination of the structural paths indicated that HB (β= 0.528) and EE (β= 0.333) had the strongest effect on BI. The bootstrapping routine

Table 5. Constructs Discriminant Validity

	BI	EE	FC	HB	PE	SI
BI	-					
EE	0.614					
FC	0.693	0.796				
HB	0.848	0.638	0.762			
PE	0.808	0.653	0.741	0.826		
SI	0.696	0.828	0.736	0.740	0.673	-

Evaluating criterion: HTMT <0.85

Table 6. Constructs Analysis.

Items		Mean	SD
BI	Behavioral Intention	5.01	1.73
PE	Performance Expectancy	4.84	1.85
EE	Effort Expectancy	4.53	1.59
FC	Facilitating Conditions	4.56	1.51
SI	Social Influence	5.04	1.47
HB	Habit	4.42	1.84

Note: Items measured on a 7-point Likert scale

also validated that these results were significant at the 5% level. Despite the relationships SI→BI (β= 0.056), FC→BI (β= 0.003), and EE→BI (β= 0.002) being positive, the bootstrap did not substantiate these results.

In addition, the f^2 effect size was calculated to determine if an omitted construct had a fundamental effect on intention. An effect size of approximately 0.02, 0.15, and 0.35 is considered small, medium, and large, respectively (J. J. Hair et al., 2021). The analysis reported effects in the case of dropping HB (0.258) and PE (0.109). On the other hand, SI (0.004), EE (0.002), and FC (0.001) did not have a significant impact on the intention to use the policy.

The structural analysis concluded with the measure of approximate model fit. This test in SmartPLS is assessed by the standardized root mean square residual (SRMR). In our study, the SRMR value of 0.78 was lower than the more conservative threshold of 0.80 (J. J. Hair et al., 2021), which indicates that the model fits well the data.

5.3. Analysis of the Constructs

The construct behavioral intention (BI) is the strongest predictor of actual use (Venkatesh et al., 2012), which in our context refers to the possibility of the respondents using the policy. In our case, participants tend to agree about taking advantage of the policy (M=5.01, SD=1.73). The mean values of PE (M=4.98, SD=1.74), EE (M=4.53, SD=1.59), FC (M=4.56, SD=1.51), and HB (M=4.42, SD=1.84) indicated that these factors tend to be important to the users of the policy. Among the predictors of intention, SI (M=5.04, SD=1.47) scored the highest. Table 6 summarizes these results.

Table 7. Assessment of hypotheses.

Hypothesis	Path	Coefficient	t-Value	*p*-Value	Supported
H1	PE→BI	0.333	2.300	0.021	**YES**
H2	EE→BI	0.002	0.019	0.985	NO
H3	FC→BI	0.002	0.025	0.980	NO
H4	SI→BI	0.056	0.623	0.533	NO
H5	HB→BI	0.528	4.152	0.000	**YES**

Hypotheses evaluation criteria: t-Value>1.96; p-Value<0.05

Having examined the key components of the model, it is now possible to conclude with the assessment of the hypotheses.

5.4. Assessment of the Hypotheses

To report the results, the standardized paths between latent variables were assessed. The structural analysis found that two out of five hypotheses were supported at the 0.05 level; Performance Expectancy (PE) and Habit (HB) had their path relationships in the expected direction and significantly contributed to the model. Our analysis found Effort Expectancy (EE), Facilitating Condition (FC), and Social Influence (SI) to be non-significant regarding the behavioral intention to use the policy under study; the associated hypotheses H2, H3, and H4 were rejected as a result. Although other relationships among the constructs could have been examined, we aimed to determine the relationships following the UTAUT-2 framework. Table 7 summarizes these results.

6. Conclusion

We adopted the Unified Theory of Acceptance and Use of Technology 2 (UTAUT-2) for the acceptance of public policies. Our findings indicated that Performance Expectancy (PE) and Habit (HB) were supported in the model and had a significant impact on the intention to use the policy. Results indicate that the greater the perceived benefits for the policy recipients, the more likely it is they will use it and become accustomed to it. The construct of Social Influence (SI), although not supported, received the highest mean score (5.04) on a seven-point Likert scale. This finding suggests that social factors may also play a role in the acceptance of public policies if significant others are using them. Further, the constructs of Effort Expectancy (EE) and Facilitating Conditions (FC) were also not significant in our context, even if respondents generally agreed or strongly agreed with the related statements. In the case of EE, this could be explained by the fact that participants were familiar with the policy and did not expect particular effort in understanding it, thus making EE less relevant. In the case of Facilitation Conditions (FC), participants appeared to meet the conditions and requirements (i.e., Chinese driver's license, owning a vehicle, etc.) independently from using or not the policy.

To the best of our knowledge, this is the first study that uses the UTAUT-2 framework to study policy acceptance. The analysis shows that an instrument designed for technology adoption is also suitable for understanding the underlying factors of accepting policies, thus helping policymakers in implementing policy and re-designing (if needed) documents that can be widely accepted and adopted by the public. Moreover, the model allows for a better understanding of how public opinion perceives and responds to policies. It is also possible to identify gaps and challenges in policy design and communication by applying this model. Using a policy should first and foremost provide benefits for performing certain activities, a concept embodied in our model by the construct of performance expectancy. People are less likely to use a policy if they do not perceive it to be effective in achieving their intended goals (such as convenient travel from Macau to Mainland China). Therefore, there is a need to ensure that policies are perceived as effective by the target population. Then, one should also take into account the role of Habit in policy adoption, as people are more likely to accept policies that align with their established habits (i.e., crossing borders with China for various activities) and make such habits more convenient (i.e., now residents can also drive their vehicles to China). Hence, consideration of the established habits of the target population is recommended when designing new regulations. Although Social Influence was non-significant in our analysis, it received a high average score, suggesting its potential as a factor in policy acceptance (e.g., because significant others use the policy, one might consider using it as well).

Our study offers policymakers several points to consider. In our context, they include government officials from Macau's Department of Transport and Public Works, representatives from cross-border cooperation agencies like the Chinese central government, and the Zhuhai municipal government, who play crucial roles in designing, implementing, and overseeing policies. In addition to considering the factors contributing to policy acceptance highlighted in this study, a direct implication of the policy is the need to allocate resources for developing and maintaining border checkpoints, roads, and other facilities to safely and efficiently accommodate the increased cross-border travel. Without adequate infrastructure, the policy's benefits may be compromised, leading to congestion, safety hazards, and economic inefficiencies. Thus, the planning of continued investment in transportation infrastructure is essential to accommodate cross-border travel safely and efficiently. In conclusion, the adaptation of the UTAUT-2 to the acceptance of public policies sheds light on the factors that contribute to policy adoption as well as establishes the model's applicability to policy acceptance. Our findings highlight that performance efficiency and habit are crucial factors in policy acceptance, while social influence also plays a role. By taking these factors into account, policies that are more likely to be accepted by their target population can be designed and implemented.

7. Limitations and Future Research

It is important to acknowledge the unique cultural, socio-economic, and political factors that influence policy acceptance in our context. Macau's rich blend of Chinese and Portuguese cultural heritage, alongside its heavy reliance on tourism and gaming industries, and its status as a Special Administrative Region of China, all play significant roles in shaping residents' attitudes (Lampo, 2023), including policies. These factors must be considered when interpreting the study's findings and assessing their generalizability to other contexts. The study has some limitations; in particular, convenience sampling was utilized, assuming respondents were similar to the overall target population, but this may not hold. A larger sample size would have allowed for more robust statistical analyses, such as multi-group analysis (MGA), to account for potential variances across socio-cultural characteristics. To gain richer insights into the motives underlying policy acceptance, future studies should assess additional constructs and incorporate qualitative questions in surveys to understand why respondents perceive factors like effort expectancy, social influence, and facilitating conditions but may not act upon them. Furthermore, future research could expand on the study's focus on the long-term economic impact of the policy. For example, evaluating the economic repercussions experienced by Macau (due to citizens traveling to China for shopping) would provide valuable insights into the policy's long-term effects on the region's economy. Integrating such considerations into future studies would enhance the universality and applicability of our findings to a broader range of cultural and policy contexts.

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