Political Discriminatory Product Differentiation

An Investigation into Airlines' Route Map Treatment of Taiwan

By Lauren Stagg

Abstract

The discriminatory behavior and actions of firms are commonly viewed through the lens of internal human resource management—such as hiring and payroll practices. Recent research highlights a more discrete form of discrimination that presents itself through product design. Discriminatory product differentiation is a competitive strategy in which a firm will design its product to appeal to certain internal and external stakeholders, even at the expense of losing a subsegment of potential customers and profitability. This paper explores the theory of discriminatory product differentiation by examining international airlines' responses to the political dispute over Taiwan's diplomatic status via their airline route map design. This paper also examines how an airline's membership in an international air alliance (i.e., SkyTeam, Oneworld, or Star Alliance) may have a moderating effect on this relationship. The results of this study provide a further understanding of how firms compete abroad alone and in groups. Additionally, it provides a further understanding of how international firms and alliances respond to international political disputes threatening their business interests. The broader impact of this study is to provide further insight into the dynamics surrounding international business practices and public policy.

Keywords: product differentiation, discrimination, airline alliances, principal-agent, competitive strategies, political

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1. Introduction

Discrimination is often associated with the spheres of politics and social justice. That said, it can also be seen in international business (IB) and management, especially when examining the employment processes of firms. Becker (1957/1971) provided some of the founding literature on discrimination in the workplace and was the first to identify that economics plays a role in discriminatory practices; he asserted that economics is key to understanding how discrimination manifests itself through wage differentials. Recent studies have further investigated why and how discrimination surfaces in firms' selection, or employment, processes (Lee et al. 2015). The research of Lee et al. (2015) provides an example of how current IB and management research primarily focuses on how the firm itself implements discriminatory practices. They find that—in additional to favoritism for those in the same social group—factors including self-interested considerations, stereotypical beliefs about candidates' abilities, and expectations of future interdependence all play a role in a decision makers' hiring processes. Conversely, there is a lack of research to investigate how the stakeholders of a firm may steer the business to implement discriminatory practices. In other words, there is a lack of research to answer the question, "can outside influences push a firm to employ discriminatory practices?" Vaaler and Waldfogel's study (2019) was the first to investigate this matter and did so by marrying the concepts of discrimination and the competitive strategy known as differentiation.

The concept of product differentiation dates back at least as far as 1933 when Edward Chamberlin wrote and published *The Theory of Monopolistic Competition*. Though this concept has become more robust and complex with time, the basic belief underlying it is largely unchanged. Differentiation exists when an industry's supply and demand is heterogeneous which

instigates buyer and seller relationships via preferences (Hunt, 2011; Chamberlin 1962). A recent study suggests there is a specific—and perhaps much darker—form of a differentiation strategy that has gone unnoticed; this approach has been labeled "discriminatory product differentiation" (Vaaler & Walfgoel, 2019).

Discriminatory product differentiation refers to "designing products others might object to and avoid," commonly with the differentiation being based around politics, law, religion, or culture (Vaaler & Waldfogel, 2019, p. 72). Simply put, this differentiation strategy takes advantage of discriminatory beliefs to appeal to stakeholders within and outside of the firm. There are examples across various industries that can demonstrate, to some extent, this phenomenon; for example, one study found that for-profit hospitals' location strategies may be unintentionally discriminatory towards black communities (Norton & Staiger, 1994, as cited in Vaaler & Waldfogel, 2019). Another study assessed the U.S. daily Newspaper market and found that a newspaper's positioning caters to the racial majority of the area for which it serves; though there are various dynamics related to this outcome, one potential source of this differentiation is the discriminatory preferences of the customer (George & Waldfogel, 2003, as cited in Vaaler & Waldfogel, 2019). Vaaler and Waldfogel's (2019) study adds to the investigation of this phenomenon; to do so, they used the international airline industry as the case study. Ultimately, their research provided empirical evidence to suggest that this differentiation strategy does exist; even further, they suggest customer preferences and owners' tastes are the two variables that factor into a firms' decision to employ this strategy.

To investigate this differentiation strategy, Vaaler and Waldfogel assessed airline route map treatment of Israel as countries, based on cultural beliefs, vary in their acknowledgment of Israel's existence. The research indicated international airlines do practice culturally based

discriminatory differentiation tactics against Israel. Accordingly, there is an apparent opportunity to continue this research by investigating whether discriminatory strategies are used in other scopes as well, like when the discriminatory actions are politically motivated. In this study, I will investigate if discriminatory product differentiation exists when discriminatory actions are based on political conflict. To do so, a method highly aligned with Vaaler and Waldfogel's will be employed by analyzing the route maps of international airlines. For this study, Taiwan is the subject of focus.

One may inquire as to why Taiwan is a suitable case study for this research; the explanation of this requires a summary of Taiwan's history and current diplomatic status. Taiwan's history is extensive as its political history is sorted. Taiwan had an indigenous population but was later colonized by differing European powers. The Qing dynasty took control from the European powers and kept this control for around two hundred years. In 1896 Japan secured control over Taiwan only to lose that control to China after World War II. Soon after, the Civil War that was occurring in China between the nationalist party and communists resulted in a communist victory; the nationalist refugees then fled to the island of Taiwan. Since then, Taiwan—also known as the Republic of China (ROC)— has developed extensively. There are many political parties within Taiwan, with the prominent parties being the Democratic Progressive Party (DPP) and Chinese Nationalist Party or "Kuomintang" (KMT). The KMT party does not support Taiwan sovereignty, but rather focuses on having close relations with China (OfTaiwan, n.d.-a). The DPP advocates for Taiwan's national identity, but what national identity means varies—for some it means independence while for others it means maintaining the status quo (OfTaiwan, n.d.). The beliefs of the DPP can be seen through their trade relations;

recent attempts of the DPP include trying to diversify Taiwan's trade relations and partners to decrease their dependence on China as a trade partner (Maizland, 2021).

China—officially known as the People's Republic of China (PRC)—has made it clear that it will eventually unify Taiwan with the mainland (Maizland, 2021). It does not support a sovereign Taiwan and firmly acts under the belief that Taiwan is a province of the PRC. Internationally, China is strict on this belief and has acted against individuals, organizations, and countries that intentionally or unintentionally refer to Taiwan as a country. One example of this enforcement provides the basis for which discriminatory product differentiation will be examined—that example being airlines.

In early 2018, the PRC instructed airlines to refrain from referring to Taiwan-based destinations on electronic reservation systems as part of a separate (from China) sovereign nation-state; airlines, including those from the three major air alliances—Star Alliance, Oneworld, and SkyTeam—all complied with this instruction by no longer referring to, say, Taipei as part of "Republic of China" (BBC, 2018). That said, the PRC did not instruct airlines on how Taiwan should be depicted on airline route maps. Vaaler and Waldfogel's (2019) study demonstrated that based on cultural beliefs, airlines employed discriminatory product differentiation through their depiction of Israel on airline route maps. Given the ambiguous status of Taiwan internationally, Taiwan's depiction on airline route maps could also deviate based on the political beliefs of nations, and the beliefs of the airline customers and owners within them. The central questions that provide the basis of this research follow: do airlines depict Taiwan differently on their airline route maps to satisfy the political preferences of their customers and the political tastes of their owners? Do airlines practice political discriminatory product differentiation? This study addresses these questions.

It is also essential to touch upon why airlines within the major air alliances were given special attention in this investigation; given the theories on principal-agent relations, resource dependency, and alliances, Vaaler and Waldfogel also investigated whether being an air alliance member had a moderating effect on whether to employ this product differentiation strategy. Their research indicated that alliance membership did not factor into firms' decisions to pursue such a strategy. This study will build off the investigation of the impact of alliances; that said, this potential alliance relationship will be investigated through two different approaches: alliance membership as an independent variable and as a moderating variable.

Ultimately, this study aims to further investigate the theory of political discriminatory product differentiation by providing empirical evidence of politically based discriminatory practices within the airline industry. It will also add to current understandings of discriminatory practices in the marketplace, differentiation strategies within the realm of competitive strategy research, and the impact of alliances on an individual firms' business strategy and functions. Section two immediately following this introduction will examine the relevant streams of literature that form the foundation of this study, as well as how this research will add to current understandings within these fields. Section three will then discuss the research design and methodology of the study. Section four will discuss the statistical analyses. Section five will discuss the findings. Section six will conclude this study by discussing its limitations as well as the potential for future research.

2. Relevant literature Streams

The following subsections discuss the streams of literature that provided the foundations for this research. This further investigation of discriminatory product differentiation is based on theories within economic discrimination, competitive strategies, international alliances, principal

and agent relations, and resource dependency. Following a discussion of these topics, the founding literature on the theory of discriminatory product differentiation will be overviewed.

2.1 Discrimination in Practice

Research conducted within the realm of discrimination in the marketplace is lacking as compared to the other streams of literature mentioned below. That said, the existing research surrounding marketplace discrimination investigates 1) where we see discrimination within the marketplace and how it is executed; 2) the drivers or motivations behind economic discrimination; and 3) how politics plays a role in firms' discriminatory behavior. Overall, there is a lack of theoretical importance placed on this topic, which provides an opportunity for further investigation given the ever-growing and ever-important discussion surrounding discriminatory actions internationally.

The existing literature surrounding discrimination as it pertains to economics and markets is founded within Becker's (1957/1971) research on the *Economics of Discrimination*. Becker discusses where discriminatory action emerges, which includes the practices of hiring employees and selling to customers. He argues that individuals have a "taste for discrimination" that impacts their actions; this taste is so strong that an individual is willing to forfeit something or incur some loss to satisfy this taste. Through a series of mathematical models, Becker provides empirical evidence to suggest that there are two main reasons why people discriminate in these environments (hiring and selling)—these reasons being customer preferences and owners' tastes. When using a discriminatory practice to cater to customer preferences, it can be a profit-maximizing strategy in which the firm is catering to its target market. For example, a landlord may decline to rent an apartment to new immigrants not because the landlord harbors any animus against immigrants, but because the landlord's other tenants do.

Catering to owners' tastes is different. An individual will use their firm to indulge their own preferences, whether that be profitable or unprofitable. For example, the same landlord harbors animus towards immigrants even stronger than the other tenants. They go so far as to take out advertisements in the local newspaper denigrating immigrants as "dangerous" tenants. The advertisements may attract more tenants profitably or deter many non-immigrant would-be tenants who had no idea of the landlord's views and find them extreme–unprofitably for the landlord. This concept may seem counterintuitive in larger firms where ownership and control of the firm is typically separated between shareholders and managers. But as will be discussed below in section 2.4—Jensen and Meckling's (1976) foundational research on principal-agent relations—a manager may pursue actions counterproductive to the firm's profitability. Their research functions under the assumption that utility maximization is a focus for both parties in a principal-agent relationship; management-agents may not act in the best interests of the shareholder-principals if it impedes management-agent utility potential.

Several empirical studies have tested Becker's theories. For example, Gentzkow and Shapiro (2010) use Becker's theories to explain partisan political slants in media. Additionally, there has been some research adjacent to discrimination such as politically based targeting strategies. Jung and Mittal (2020), in their review on research on political identity and consumers, highlight political orientation's impact on customer segmentation and targeting (Mitchell et al., 2014, as cited in Jung & Mittal, 2020) and identity-based consumption (Oyserman, 2009, Oyserman & Schwarz, 2017, as cited in Jung & Mittal, 2020). Jung and Mittal (2020, p. 69) propose that political identity encompasses "attitudes, motives, logics, interpretations of how the world works, how the world should work, and how societies may approach various issues and problems." Ordabayeva and Fernandes' (2018) research comes

closer to the discussion of how politics can factor into differentiation strategies through arguing that a consumers' political ideology unconsciously affects product preferences—either through vertical or horizontal differentiation. As for how politics can impact product design, research has been directed at product design for political parties and representatives during political campaigns (Marshment, 2001). As far as consumer goods and services are concerned, Endres and Panagopoulos (2017) discuss how companies taking stances on political issues are either awarded through "buycotts" or punished via boycotts by consumers. Odziemkowska's (2021) recent study surrounds political and social movements' impact on organizations; more specifically, this study investigates how the political identities of a social movement organizations' (SMO) and firms' audience will impact whether a collaboration between an SMO and firm may occur. In other words, the study investigates how customer preferences affect collaboration dynamics and finds that negative customer perception of a firm will drive an SMO to form a collaboration with a firm to turn "contestation into collaboration."

Discriminatory taste dynamics have drawn less empirical research attention. That said, Becker's (1957/1971) ideas supply the foundation for what Vaaler and Waldfogel (2019) define as "discriminatory product differentiation"; they argue that a firm will design a product to adhere to the discriminatory preferences of its customers or owners, even at the expense of losing a subset of potential customers. They applied their argument to route map depictions of Israel and the anti-Semitic customer preferences and owners' tastes of airlines making those maps; but, discrimination spans many areas. Consequently, there is a wide field for further empirical exploration.

This study expands on Vaaler and Waldfogel's (2019) research by exploring potential politically based discriminatory practices within the airline industry. Ultimately, this research

will add to the existing literature by demonstrating that Becker's initial theories on *Economics of Discrimination* (1971) continue to have application in today's markets. Becker's (1957/1971) assertions on customer preferences and owners' tastes in combination with Vaaler and Waldfogel's (2019) research, therefore, provide the foundation for the first two hypotheses of this study.

2.2 Competitive Strategies

In mentioning Vaaler and Waldfogel's (2019) "discriminatory product differentiation" theory, a discussion of competitive strategies is helpful for a better understanding of both the existing literature as well as where the "differentiation" strategy theory was born.

The study of strategic management has grown immensely; yet, in the context of business, it has not been studied long. Frederick W. Taylor (1911) asserted that, for a firm to achieve maximum efficiency, it should choose one specific approach to completing its tasks— rather than utilizing multiple strategies—to obtain an advantage. As the field grew, more approaches to competition emerged in practice. Porter's *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (1980) provided management researchers and practitioners with many essential tools to analyze industries and the competition within them. As it pertains to this study, Porter (1980) provided a "generic" strategies framework assuming that there are three strategies a firm can pursue to compete within an industry: overall cost leadership, differentiation, and focus. The generic differentiation strategy is defined as creating a good or service that is perceived, across the entire industry, as unique. In this study, the differentiation strategy may be applied to the airline industry through differentiated product design of airline route maps. That said, a focus strategy could also matter in this study context. A focus strategy involves serving a particular buyer group or geographic market. In following a focus strategy, the

firm may narrow its market more effectively than its competition which therefore provides a competitive edge. A focus strategy can be achieved through either a focus on differentiation or cost leadership, but for a specific industry segment. For this study, consider the strategy of discriminatory product differentiation as being a focus strategy via differentiation.

Competitive strategy research did not end with Porter (1980). For example, Hutzschenreuter and Israel (2009) consolidated pertinent findings in their review of competitive strategy research. They cite research surrounding strategic groups, which are business clusters within an industry that follow similar competitive strategies. For example, airlines in the Star Alliance, Oneworld, and SkyTeam alliances would all be within one strategic group in the airline industries as these airlines focus on serving international business travelers. Hutzschenreuter and Israel (2009) also discuss Fiegenbaum and Thomas's (1995) research, which indicates firms within a strategic group tend to employ strategies like their competitors within the same strategic groups. Strategic groups act as reference points and therefore influence the type of strategic response employed by firms (Fiegenbaum and Thomas 1995; Nair & Filer 2003). Hutzschenreuter and Israel (2009) discuss other research (Glen and Hambrick 1995; Gordon et al. 2000; Greve 2000) indicating the importance of firm size in increasing inertia. This indicates firm size will be a necessary control variable for this study as it likely influences how much power and influence a firm has within an alliance and the greater strategic group.

The current study, like that of Vaaler and Waldfogel (2019), will also draw on ideas associated with a differentiation strategy. Indeed, it investigates "political" discriminatory product differentiation. Vaaler and Waldfogel's research explored the execution of discriminatory practices based on religion and culture. This study explores the same for politics and international relations. Vaaler and Waldfogel studied Israel and Jewish culture and religion.

This study focuses on Taiwan and Chinese politics and international relations. More specifically, this study explores product differentiation in airline route maps relevant to debates over Taiwan's sovereignty. Given Becker's (1957/1971) assertions on customer preferences and owners' tastes, Vaaler and Waldfogel's (2019) prior research discussed in section 2.1, and the discussion on differentiation as a strategy as discussed in the current section, I hypothesize the following:

Hypothesis 1: *International airlines are more likely to present Taiwan as part of China in airline route maps when their customers have stronger pro-China sentiments.*

Hypothesis 2: *International airlines are more likely to present Taiwan as a sovereign nation-state in airline route maps when airline owners have stronger pro-Taiwan sentiments.*

2.3 Alliances

This study, in addition to exploring customer preferences' and owners' tastes' impact on product design, will investigate the potential for alliances to have a moderating effect on this relationship. The literature surrounding alliances is vast and explores several facets including, but not limited to, the formation of alliances, the advantages and disadvantages of alliances, and the types of alliances that may form (both formal and informal).

For this research, the founding literature of focus comes from Dunning (1993/2008), Casseres (1996), and Moore (1996). Dunning (1993/2008) defined the multinational enterprise (MNE), which is applicable given the three major air alliances under investigation for this thesis can be considered MNEs. Ultimately, Dunning defines an MNE as a firm that engages in cross-border production and transactions; he argues that what makes an MNE unique is its ability to marry "cross-border dimension[s] of value-added activities of a firm with the common governance of those activities" (Dunning and Lunden, 2008, p. 99). Dunning highlighted the

profound intricacies of MNEs and alliance networks and the growing importance in understanding and monitoring networks (Penrose, 1994, as cited in Dunning, 1993/2008). Following Dunning comes Moore's (1996) discussion of the importance of coevolution within business ecosystems. Ultimately, Moores' stance is that the success of a firm is no longer defined only by achieving scale and scope, but also through understanding the competitive landscape and continuing to evolve and innovate with your competition to drive change and expand a firm's capabilities. The perfect environment for coevolution to persist is within the environment of "alliance networks," an alliance theory created by Casseres. Casseres' (1996) explored international alliances as an effective tactic for market competitiveness. Casseres brings to light the idea of "collective competition" in which rivalry within a specific market usually takes place between allied firms. He also discusses the idea of "alliance networks" in which multiple identifiable groups are competing against each other within an industry. One can consider Star Alliance, Oneworld, and SkyTeam to be three alliance networks, and the competition between said sub-groups is considered "group-based" competition. Casseres insists that an alliance network must have some form of collective decision-making mechanisms, whether formal or informal, to execute strategic moves. Casseres also indicates that smaller firms are substantially aided by the advantages of an alliance group while larger firms' advantages are less obvious. Ultimately, Dunning (1993/2008), Casseres (1996), and Moore (1996) are some of the first to inquire into what an international firm is, what an international alliance is, why firms become members of an alliance, how alliances compete, and what benefits and detriments an individual firm faces with alliance membership.

Given the current study aims to investigate how alliances may influence a firm's actions, it was necessary to determine whether more recent studies have investigated this specific area of

interest. De Jong (2015) studied how social and human capital impacts a firm's willingness to cooperate within an alliance; their findings suggest an understanding of a potential partner firms' social and human elements can lead to a stronger alliance. Shijaku, Larraza-Kintana, and Urtasun-Alonso (2020) investigated how network centrality plays a role in a firm's influence within an alliance; their findings align with the understanding that centrality is an important factor for a firm within an international alliance to have greater visibility, power, and social influence—among other factors. Vaaler and Waldfogel (2019) also cite past studies that explore the impact of beliefs, values, and similarity on alliances' cost savings; these studies indicated that there is a strong negative relationship between an increase in national belief and value similarities between firms in an alliance and the costs associated with alliance membership (Parkhe, 1991, 1993, Madhok & Tallman, 1998, Sarkar et al., 2001, as cited in Vaaler and Waldfogel, 2019).

The combination of theories explaining alliances and alliance-based competition, as well as more recent research, leads to the following question: How does alliance membership influence a firm's decision making about product design? The following two sections of this literature review—principal-agent relations and resource dependency—will review theories providing guidance in answering these questions. In doing so, they also provide justification for the exploration of alliances as a moderating variable in follow-on empirical analyses.

2.4 Principal-Agent Relations

As this study assesses how an alliance may impact a firm's decisions—specifically its product design—it is essential to review some of the founding literature on how power and influence manifests itself in a business context. As will be discussed, power and influence within

the world of international strategic alliances can be explained by principal and agent theory logic.

Jensen and Meckling (1976) define principal-agent relations as a (formal or informal) agreement between a “principal” and “agent.” The agent acts on the principal's behalf consistent with the terms of the agreement; for this agreement to be created, the principal delegates authority to the agent to act on the principal’s behalf. Jensen and Meckling assert that agents can and do often act opportunistically in ways that are not necessarily in the principal’s best interest. Holmstrom (1979) further explores the relationship and asserts that with greater information sharing from the agent, the better the outcome will be for both the principal and the agent.

More recent research expands the investigation and application of this theory. Panda and Leepsa (2017) summarize findings involving so-called “principal-principal” relationships where there is a major owner, holding most of the shares and control, and smaller equity holders with less power and influence. Not surprisingly, these smaller equity holders find it more difficult to act in their best interests (Demsetz and Lehn, 1985).

This study delves into such principal-principal conflicts. Smaller airlines—who likely have smaller equity-like interests as members of the alliance—may be influenced to design their product to adhere to the expectations of larger, more influential owners within air alliances.

Given airlines within air alliances differ in size, market share, and visibility, there is reason to believe that air alliances are unequal in power and influence. The theories surrounding principal and agent relations, thus, provide an explanation of firms’ behavior when they operate in these imbalanced contexts.

2.5 Resource Dependency

Resource dependency theory provides one lens through which to view that imbalance. The fathers of resource dependency theory, Pfeffer and Salancik (1978), identify factors influencing interdependence between firms. For them, increased degrees of uncertainty prompt increased interdependence; they also hold that firms controlling more assets valuable to an interdependent relationship also have more influence in that relationship. They cite Thompson and McEwen (1958) when establishing that demands for certainty, autonomy, and discretion are also underlying factors determining ways firms interact (mergers, alliances, joint ventures, regulations, etc.). More recent research has extended resource dependency theory. For example, Hillman et al. (2009) cite Meznar and Nigh's (1995) findings that firms more dependent on the government tend to engage in political activity; this specific finding may have some applicability in this study since several airlines studied here are state-owned.

As has been discussed, resource dependency theory is another lens for analyzing the behavior of airlines within alliances. An assumption in this study consistent with resource dependency theory is that airline size, market share, and visibility explain differences in power and influence within alliances, including power and influence over product design. This assumption is new and novel and motivates the following hypotheses:

Hypothesis 3: *International air alliances impact the airline alliance members' route map treatments of Taiwan*

Hypothesis 4: *The negative effect of customer preferences on the route map treatment of Taiwan is moderated by alliance membership*

Hypothesis 5: *The positive effect of owners' tastes on the route map treatment of Taiwan is moderated by alliance membership*

2.6 Discriminatory Product Differentiation

Vaaler and Waldfogel (2019, p. 70) demonstrate that both customer and owner preferences factor into a firm's decision to pursue a discriminatory product differentiation strategy; with this strategy, a firm designs a product "to favor some customers over others [so that] a firm can discriminate through customer self-section rather than differential treatment." In other words, the firm is not perpetuating discriminatory behavior but rather catering to its customers' and owners' preferences. Interestingly, Vaaler and Waldfogel did not find empirical evidence to prove that alliance membership impacted a firm's decisions to alter its product design. This study, in addition to determining if airlines are applying politically based discriminatory practices through route map design, will investigate whether being in an alliance moderates this relationship.

From reviewing the existing and applicable literature, research surrounding firms employing discriminatory actions is limited regardless of in what context these actions are practiced (e.g., economic, religious, political). Furthermore, regarding alliances, not much can be found on how alliance membership can impact a firm's marketing actions such as product design. Finally, given the idea of discriminatory product differentiation is a relatively new concept brought to light by Vaaler and Waldfogel (2019), and this concept was investigated within the scope of religious and culturally based discrimination, this study will help in determining whether application extends to a political scope within the airline industry.

3. Methodology

Next, we can discuss the empirical methods used to test our five hypotheses. The following sections will provide an overview of the data collection methods and variables of focus for this study.

3.1 Data Collection

There are more than 1000+ airlines globally, but not all airlines merit sampling to study. To determine which airlines were most appropriate, the standard outlined in Vaaler & Waldfogel's (2019) study was used. To be analyzed, an airline needed to fly to at least 25+ destinations and some of these destinations must have come from outside its headquartered country; these airlines were deemed "international" in operational scope. The International Air Transport Association's (IATA's) list of 1,125 airline codes was the starting point for identifying potential airlines and applying the international sampling filter.[1] Each airline was first searched in Google to determine if it was a commercial airline as this study excludes any charter or distribution airlines. From there, it was necessary to determine the number of destinations each airline had. Wikipedia turned out to be a helpful source for this information. In addition, a precedent for this entire study was to source as much information from 2018 as possible as that was the year China requested airlines to refer to Taiwan explicitly as not being a separate sovereign state.

To determine how many destinations each airline had circa 2018, the Wayback Machine internet archive was used.[2] This archive takes and stores pictures of past websites for retrieval purposes. After finding the airline's respective Wikipedia page, the URL was plugged into the Wayback Machine. Not every Wikipedia page for each airline was archived in 2018. When that occurred, the picture taken closest to 2018 was chosen. Consequently, years ranged anywhere from 2016 to 2021. If an airline did not have 25+ destinations, it was not sampled.[3] With this sampling approach, 77 airlines were identified. Of those 77 airlines, 19 airlines did not have route maps displaying East Asia. That left 58 airlines in the sample for analysis. A table listing all 58 airlines analyzed is included as Appendix A.

The following sections will discuss the variables measured and the secondary data gathered for each variable. Figure 1 below is a graphic representation of this study's model:

See Figure 1 below: Visualization of this study's model

3.2 Independent Variables

The foundation of this study is based on the independent variables of *customer preferences (CP)* and *owners' tastes (OT)*.

The *CP* variable tells us what an airline's customer base feels about China—the preference score will lean either towards a higher favorable or lower unfavorable view of China. There were two necessary pieces of information for measuring CP, the first piece of information being what the customer base of each airline is. To determine this base, I had to find which percentages of customers from different countries were interested in flying on each airline. Following Vaaler and Waldfogel (2019), that meant measuring customer search intensities by country for the name of each airline. The Google Trends tool provides that measure.[4] Google Trends allows measurement of search intensity by country location. For this study, a time range of January 1, 2004, to January 1, 2018, was used.[5] From there, each airline was searched, and the top 10 countries were selected to maintain consistency across airlines.

This approach provided a reasonable measure of an airline's customer base. For example, the Google Trends search for "Aegean Airlines" yielded more than 10 countries in which the airline was searched. The maximum index value for each country was 100. The country with the highest index value, that being 100, was Cyprus. The next nine countries had index values ranging from 87 to 1. After gathering the index values of the top 10 countries, each country was weighted. The weighted customer location score for each airline was calculated following this formula:

$$WVc = \frac{Googlec}{\sum c \epsilon C \; Googlec}$$

Where WVc is the weight value assigned to country c, Googlec is the index value assigned to country c, and C is the full set of countries.

The second piece of information needed to determine the CP of an airline was country-by-country data on China favorability. In an ideal setting, such data would have been gathered from one source and year. That said, there were 166 countries for which China favorability data was needed and the availability of such data did not cover all 166 countries. Ultimately, there were 130 countries for which I could source China favorability data. Appendix B displays the China favorability score for each of the countries. All favorability scores sourced were recorded as a percentage of the population, and so for this study, the favorability scores are on a scale of 1 to 100. For example, 44% of the representative sample surveyed in Sweden had a somewhat or very favorable view of China; accordingly, the favorability score for China was 44 (Pew 2018 Global Attitudes survey). The sources for the China favorability data were as follows: Afrobarometer,[6] Arab Barometer,[7] Central Asia Barometer,[8] Central European Institute of Asian Studies,[9] Chatham House,[10] Eurobarometer,[11] Gallup,[12] Hong Kong Public Opinion Research Institute,[13] Ireland Thinks,[14] ISEAS-Yusof Ishak Institute,[15] Latinobarómetro,[16] Pew Research Center,[17] Terror Free Tomorrow,[18] The Americas Barometer,[19] The Arab Opinion Index,[20] The Center for International and Security Studies at Maryland,[21] The International Republican Institute,[22] and The Lowy Institute.[23] The data gathered ranged from the early 2000s to 2021—the justification for this wide time range was that a country population's China favorability did not significantly shift in those 21 years. For the remaining 36 countries, China favorability data was constructed using favorability scores in geographically, culturally, and/or economically near countries. Appendix C describes how I constructed each preference score.

With the values from the Google Trends analysis and the China favorability score, the *CP* of an airline can be calculated as follows:

$$CPi = \sum_{c \in C} \left(\frac{Googleci}{\sum_{c \in C} Googleci} \right) CSSci$$

Where CPi is the *customer preferences* for airline i, *Googleci* is the Google search index value for airline i in country c, *CSSci* is the China Favorability Score for airline i in country c, and C is the full set of countries. For a list of the *CP* scores by airline, see Appendix D.

Following general competitive logic, a business will try to adhere to its customer's preferences to establish a relationship and capture their business. So, for this study, if an airline's customer base has a higher preference score for China, this customer base would prefer that Taiwan not be acknowledged as a separate sovereign state. A lower score means that this customer base would prefer that Taiwan be acknowledged as a separate sovereign state. How Taiwan is presented on a route map can be presented in a spectrum as pictured in Figure 2.

See Figure 2 below: Spectrum of political stance on Taiwan's sovereignty and what this means for route map treatments

The second independent variable measured is *OT*. The *OT* variable provides us with a measure of how an airline owners' tastes may also affect how Taiwan is presented on the airline's route map. Following Becker's (1957/1971) theories on economic discrimination and Jensen and Meckling's (1976) research on principal-agent relations, one may abide by their taste for discrimination even at the expense of something else, say profits. To put this in context, through this variable, we establish that an airline may follow its owner's discriminatory tastes even at the expense of the airline losing a subset of potential airline customers.

To generate data for this variable, we first determined which airlines were state-owned and which were privately owned circa 2018. This distinction was made because state-owned airlines provide a sufficient proxy measure for determining owners' tastes—that being the existence of a "de facto" Taiwan embassy. Only 15 small countries still recognize Taiwan as the Republic of China—a sovereign state, separate from The People's Republic of China. Consequently, Taiwan has only a handful of conventional embassies around the world.[24] But, many countries give Taiwan government institutions abroad de facto embassy status. This gives, say, a Taiwan trade office located abroad, embassy-like characteristics. Host countries treat the office as if it were Taiwan soil. Personnel in the office are given diplomatic passports and permitted diplomatic immunities such as immunity from prosecution for most crimes committed locally. These offices are essentially unofficial embassies that are able support Taiwan economically and not anger China, ultimately promoting a peaceful resolution of the political tensions between the two.

To determine which countries had a de facto embassy circa 2018, Wikipedia was first referenced as it has a page listing which countries have a Taiwan de facto embassy.[25] This Wikipedia page was then plugged into the Wayback machine to see what the de facto embassy statuses were circa 2018. From there, we went directly to the source to confirm that there was a de facto embassy website.[26] Of the 58 airlines that were analyzed for this study, there were 13 airlines that were state-owned and had a Taiwan de facto embassy. In context of this study, this means there were 13 airlines whose *OT* favored Taiwan. Appendix E provides this owners' tastes information.

Lastly, we probe for support for Hypothesis 3 and alliance effects two ways. First, we include a 0-1 dummy for membership in any of the three alliances—this new variable was

termed *allied airline (AA)*. Second, we include three 0-1 dummies for membership specifically in the Star, Oneworld, or SkyTeam alliances—these variables were termed *Star Alliance member*, *Oneworld member*, and *SkyTeam member*. To determine these memberships, we looked at the lists of airlines at Star Alliance, Oneworld, and SkyTeam alliance websites. We then checked those memberships against information at the individual airline websites.

3.3 Dependent Variable

The dependent variable for this study was *route map treatment of Taiwan (RMT)*, and it took its form as 1 of 3 ordered outcomes—0, 1 or 2. The first step in determining the *RMT* of each airline was to ensure that all airlines analyzed had an online route map. Online route maps are accessible by all current and potential customers and can be updated easily. In addition, the online route map allowed for easier access to older versions through the Wayback Machine, which aided in getting as much data from 2018 as possible. All airlines analyzed had an online route map. That said, due to the limited archiving via the Wayback Machine, some route maps used in this study came from years after 2018, a few as late as 2022.

The next step in determining *RMT* was to determine how countries were displayed on the map. Some route maps did, and others did not display country names. Some route maps labeled select countries, while other route maps labeled all countries. An example of a route map that did not display any country names is shown in Figure 3.

See Figure 3 below: Air Europa's online route map—no countries distinguished.

Air Europa uses its alliance's (i.e., SkyTeam's) route map. But this map only displays city destinations—not countries. It also does not label the city destinations until the cursor hovers over it. An example of a route map that displays only select countries is shown in Figure 4:

See Figure 4 below: Korean Air's route map—all countries shown, select countries labeled

In Korean Air's route map, all countries are shown. That said, only a select few are labeled; some countries like India and China are labeled whereas many of the Southeast Asian countries remain unlabeled. Finally, a great example of a route map that displays and labels all countries comes from Lufthansa and is shown in Figure 5.

See Figure 5 below: Lufthansa's airline route map—all countries distinguished and labeled

After establishing a standard for what a country is treated like on an airline's route map, it was then possible to analyze how Taiwan was treated. Like Vaaler and Waldfogel's (2019) study, there were three ways in which Taiwan was treated on an airline route map: embraced, avoided, or denied.

Taiwan was considered "embraced" if a route map went out of its way to differentiate Taiwan in a positive light. For an example of this route map treatment, see Figure 6.

See Figure 6 below: Alaska Air's route map as an example of a Taiwan embracer

This route map comes from Alaska Air, and in it we see that Taiwan is labeled in traditional Chinese. This is significant as mainland China has fully adopted simplified Chinese while traditional Chinese remains prominent within Taiwan. Ergo, Taiwan is labeled in a way that aligns more closely with the Taiwanese than the Chinese. Embracer route maps received a value of 2 on the 0-2 ordered scale.

Avoidance was defined as an airline choosing not to display or distinguish any country at all. An example of a neutral map treatment of Taiwan comes from Pakistan International Airlines (PIA) and can be seen in Figure 7. No countries are distinguished in any way and only specific destinations are marked. In doing this, PIA does not have to either positively or negatively differentiate Taiwan. It can avoid the Taiwan debate altogether. Avoider route maps received a value of 1 on the 0-2 ordered scale.

See Figure 7 below: Pakistan International Airlines' route map as an example of an "avoider"

The final way in which Taiwan could have been treated was to be denied on a route map. This means that Taiwan was negatively differentiated when compared to other countries. An example of a route map that denies Taiwan is shown in Figure 8.

See Figure 8 below: Hawaiian Airlines' route map as an example of a Taiwan denier

In this example from Hawaiian Airlines, Taiwan is shown but not labeled like other countries. Taiwan is not labeled as "Taiwan," but rather is labeled with its city destinations (i.e., Taipei and Kaohsiung). Denier route maps received a value of 0 on the 0-2 ordered scale.

3.4 Moderating Variables

This study also investigates whether international air alliance membership has a moderating effect on the independent variables of *CP* and *OT*. In other words, we aim to determine whether international air alliance membership effects the strength and/or direction of *CP* and *OT*. To measure these potential effects, several variables were created. The categorical variable *AA* helped to distinguish whether an airline was allied, denoted as 1, or non-allied, denoted as 0.

To analyze the potential moderating impact that alliance membership may have, two additional alliance interaction variables were created: *Alliance interaction with customer preferences (AICP)* and *alliance interaction with owners' tastes (AIOT)*. These interaction variables were a product of the independent variable of interest (e.g., Customer preferences or Owners' taste) and the *allied airline* variable. The formulas used to create the interaction variable values are noted below:

$$AICP = customer\ preferences * \ allied\ airline$$

$$AIOT = owners'taste * allied\ airline$$

We also investigated whether specific air alliances differ in these potential moderating effects. To do so, we used our independent variables to create more interaction variables. These interaction variables are: 1) *alliance interaction with customer preferences of a Star Alliance airline* (*AICPSAA*); 2) *alliance interaction with owners' taste of a Star Alliance Airline* (*AIOTSAA*), 3) *alliance interaction with customer preferences of a Oneworld Alliance airline* (*AICPOAA*); 4) *alliance interaction with owners' taste of a Oneworld Alliance Airline* (*AIOTOAA*), 5) *alliance interaction with customer preferences of a SkyTeam Alliance airline* (*AICPSTAA*); and 6) *alliance interaction with owners' taste of a SkyTeam Alliance Airline* (*AIOTSTAA*). The formulas used to create these interaction variables are shown below:

$$AICPSAA = Customer\ preferences * Star\ Alliance\ member$$

$$AIOTSAA = Owners'\ taste * Star\ Alliance\ member$$

$$AICPOAA = Customer\ preferences * Oneworld\ alliance\ member$$

$$AIOTOAA = Owners'taste * Oneworld\ alliance\ member$$

$$AICPSTAA = Customer\ preferences * SkyTeam\ alliance\ member$$

$$AIOTSTAA = Owners'taste * SkyTeam\ alliance\ member$$

3.5 Control Variables

Several controls were put in place to help ensure meaningful results—these controls were classified as either a continuous or regional control. The continuous controls used for this study were the *log of fleet size* and the *safety rating* for each airline.

The log of an airline's fleet size was included to control its potential lurking effects. For example, it's possible that the larger the fleet size is, the more globalized an airline may be. The airline flies more places and consequently has a larger and more diverse customer base. And, of

course, airlines want to cater to their customer's preferences. Because of this, a larger airline may be inclined to take a more neutral stance by avoiding the Taiwan naming conundrum. This approach would likely appease most of their customers. Regarding the implementation of the log, log of fleet size was taken to make the measure more accurate as the standard deviation for fleet size within this study was large.

Safety rating was the other control variable. A safer airline more likely adheres to other global standards of operation. Again, this suggests that the airline will be more likely to remain neutral and thus avoid the Taiwan conundrum entirely. The safety ratings were sourced from airlineratings.com.[27] In order to avoid skew, the average of the safety ratings was calculated and assigned to airlines that did not have safety ratings.

The regional controls were factored into the analyses to account for any effect that distance and regional characteristics may have on *CP* and *OT* for each airline. The United Nation's (UN) subregion classification provided a simple framework to form the major regional controls. That said, the large number of UN subregions created a potential for errors of collinearity to arise during the data analysis. Because 20 out of 58 of the airlines in this sample are based in Europe, the Europe subregions were dropped. This allowed for relationships between location to be better seen and controlled for.

Ultimately, there were 10 subregion that were controlled for: 1) *North Africa*; 2) *Sub Saharan Africa*; 3) *Latin America & the Caribbean*; 4) *North America*; 5) *Central Asia*; 6) *East Asia*; 7) *Southeast Asia*; 8) *South Asia*; 9) *West Asia*; and 10) *Australia & New Zealand*.

4. Statistical Analyses

The following sections will discuss the statistical analyses conducted to either accept or reject the five hypotheses of this study. A combination of analyses were used including linear

trend lines, locally weighted scatterplot smoothing (LOWESS),[28] ordinary least squares (OLS) regression,[29] ordered probit regression (Oprobit),[30] and pairwise correlation.[31]

4.1 General analyses

As stated earlier in this study, the sample size amounted to 58 international airlines. 20 of these airlines were based in Europe, while the additional 38 were headquartered across the globe. 23 of the airlines analyzed were non-allied airlines, meaning they were not members of the Star, Oneworld, or SkyTeam alliances circa 2018. The other 35 airlines analyzed were members of one of these major alliances. The distribution of this entire sample, sorted by alliance membership can be seen in figure 9.

See Figure 9 below: Distribution of airlines by alliance, and non-allied if applicable

The summary statistics, as pictured in Figure 10, provide a comprehensive look at the data collected. The summary data on CP, for example, provides some interesting context. Though CP scores could theoretically range from 1 to 100, the minimum score within this sample was 11.3, and came from the Ireland based airline Aer Lingus. The maximum score was 74.67 and came from the China based airline Sichuan Airlines. The airline with the highest CP score that was not based in China was Ethiopian Airways, sitting at a score of 70.22. On a 1 to 100 scale, 50 would indicate a neutral view of China—anything above 50 would be viewed as a favorable score while anything below 50 would be viewed as unfavorable. The average CP score within this sample was 49.4, indicating a slightly unfavorable view of China.

See Figure 10 below: Summary statistics table with all variables of interest, measuring observations, mean, standard deviation, minimum, and maximum

A distribution graph was also generated to help visualize the frequency of the possible RMT approaches (e.g., embrace Taiwan, avoid the Taiwan debate, deny Taiwan). This graph can

be seen in Figure 11. Most of the airlines avoided the Taiwan debate by not distinguishing any countries. Following the avoidance approach, was to embrace Taiwan on route maps. Less than 10 airlines denied Taiwan on their route maps. Our sample, therefore, tended to take a more neutral or pro-Taiwan approach to the route map treatment.

See Figure 11 below: Route map treatment of Taiwan approaches by frequency

Pairwise correlations were calculated for both the constant controls—*log of fleet size* and *safety rating*—and the 10 regional controls. The full results can be seen in Figures 12 and 13. *Log of Fleet size* and *safety rating* both have low correlation coefficients with *RMT*. That said, an interesting outcome of this calculation was the directional differences. *Log of fleet size* resulted in a negative association while *safety rating* resulted in a positive association. We had some initial theories as to why this may be. For example, the larger an airline is, the more likely it is that said airline is a member of a major air alliance. Perhaps allied airlines are more likely to either avoid denoting countries or deny Taiwan altogether on their route maps. On the other hand, is it also reasonable to assume that due to economies of scale and scope, larger airlines are likely safer. In addition, larger airlines tend to serve more destinations any are therefore more globalized. A globalized airline serves a much more diverse set of customers, and therefore may try to approach its service from a more neutral standpoint. Therefore, safer airlines are more likely to either avoid denoting countries or embrace Taiwan on their route maps. These two points of view demonstrate the conflicting and interrelated industry dynamics, and only provide further motivation to explore the hypotheses of this study.

See Figure 12 below: Pairwise correlation between Route map treatment of Taiwan, log of fleet size, and safety rating

See Figure 13 below: Pairwise correlation between Route map treatment of Taiwan and regional controls

OLS and Oprobit regression were conducted to measure the constant and regional controls of interest. Results of the OLS regression can be seen in Figure 14, while the results of the Oprobit regression can be seen in Figure 15. No controls in the OLS regression passed the commonly accepted significance levels, which would equate to a p-value of 0.1 or less. That said, two controls fell within the 80% confidence level, indicating a considerable level of significance; these controls included the *safety rating* and *Southeast Asia subregion* variables. With the Oprobit regression, there was a slight improvement in significance. *Safety rating* passed the 90% confidence level, indicating a quite acceptable level of significance. In addition, the *North Afric*a, *Southeast Asia*, and *West Asia subregions* all passed the 80% confidence level. Both regressions indicated that several controls had somewhat significant impacts on the route map treatment of Taiwan and were therefore necessary to control for going forward.

4.2 Hypothesis 1

We hypothesized that the higher a *CP* score is for an airline, the more likely it is for that airline to either take the avoid or deny approach for its *RMT*. To either accept or reject this hypothesis, a mix of statistical analyses were conducted, and these analyses provided quite interesting results.

A simple pairwise correlation calculation exploring the potential correlations between our independent variables and the dependent variable was conducted.

See Figure 16 below: Pairwise correlation between route map treatment of Taiwan and core variables

The results provided a correlation of -0.1495 between *CP* and *RMT*. This is indicative of little correlation, as a generally accepted standard for strong correlation is ±0.7 and above. Though this coefficient was weak by direct correlation standards, it still provides an interesting insight regarding direction. This association was negative, indicating that the higher the *CP* is for an airline, the more likely it is that the airline with either avoid or deny Taiwan on its route map. Overall, the pairwise correlation provides evidence of a negative association.

OLS and Oprobit regressions, which included the controls and independent variables, were conducted; the outputs of these regressions can be seen in Figures 17 and 18, respectively. In both the OLS and Oprobit regression, *CP* passed the 80% confidence level, indicating a considerable level of confidence. To visualize the relationship between *CP* and *RMT*, several graphs were generated. Figure 19 is a scatterplot with a linear regression line looking at this directional relationship.

See Figure 19 below: Scatterplot with linear regression line measuring the relationship between customer preferences and route map treatment of Taiwan

There is a clear negative relationship, meaning that as *CP* increases, the more likely it is for an airline to either avoid or deny Taiwan on its route map. This makes theoretical sense. A high *CP* score is indicative of a high favorability for China. So, if an airlines' customers have favorable feelings towards China, the airline will want to adhere to those preferences to satisfy customers.

Figure 20 is a LOWESS graph, which provides a more accurate trend line given this sample's dispersed data. This graph, too, shows a negative relationship between *CP* and *RMT*.

See Figure 20 below: Lowess regression measuring the relationship between customer preferences and route map treatment of Taiwan (with points labeled by airline abbreviation)

Though the pairwise correlation did not indicate a strong direct correlation between *CP* and *RMT*, the combination of the other statistical measures provided relatively strong evidence of a negative association between these two variables. We can accept hypothesis 1.

4.3 Hypothesis 2

Hypothesis 2 proposes that *OT* has a positive relationship with the *RMT*. In other words, we hypothesized that airlines whose owners are "pro-Taiwan" are more likely to either avoid or embrace Taiwan on their route maps. The statistical evidence for this hypothesis was not as strong.

In both the OLS and Oprobit regressions, the *OT* p-values did not pass the commonly accepted levels of significance. In the linear regression, as can be seen in Figure 17, the p-value for *OT* was 0.434; this indicates that to be significant, the confidence level would have to be 56.6%. Similarly, in the Oprobit regression (See Figure 18) the *OT* p-value was 0.38, indicating a confidence level of 62%. Any confidence level below 80% is considered weak statistically. That said, it does not mean there is no relationship between these variables but rather there is not enough statistical evidence to support the hypothesis.

A scatter plot with a linear regression line, as pictured in Figure 21, provides a visualization of this relationship. Because of the categorical nature of *OT*, the LOWESS regression provided similar visual results. Ultimately, the evidence suggests that *OT* on its own does not have a large and significant impact on the *RMT*. Because of the lack of evidence, we reject hypothesis 2.

See Figure 21 below: Scatterplot with linear regression line measuring the relationship between owners' tastes and route map treatment of Taiwan

4.4 Hypothesis 3

The third hypothesis of this study proposed that international air alliances somehow impact its membered airlines' route map treatments of Taiwan. To investigate this, the *AA* variable was a key focus.

The OLS regression, as pictured in Figure 22, provided promising results. *CP* passed the 80% confidence level, indicating considerable significance. Both the *OT* and *AA* variables, though not at the commonly accepted levels of statistical significance, indicate some strength as they would become significant at the 70% confidence level. The Oprobit model, as pictured in Figure 23, improves the p-value of these variables, but the overall results remain the same; the levels of significance remained either in the 70% or 80% confidence levels.

With or without the *AA* variable, *CP* remained in the 80% confidence level. On the other hand, the significance of *OT* increased substantially, bringing its confidence into the 70% (and almost 80%) confidence level. These results suggest that alliances do have some sort of impact, whether direct or indirect, to *RMT*.

To visualize this potential relationship, a LOWESS regression was conducted. As seen in Figure 24, there appears to be a very slight negative relationship between being allied and what an airline's RMT of Taiwan is. In other words, airlines that are allied have a slightly higher likelihood of avoiding or denying Taiwan on its route map as compared to non-allied airlines.

See Figure 24 below: Lowess regression on allied airlines and route map treatment of Taiwan

Another interesting line of investigation was whether the specific air alliances matter in this relationship. Does RMT differ depending on the alliance? Results from the OLS (see Figure 25) and Oprobit (see Figure 26) regression indicate its possible.

The *Star Alliance member* variable had p-values of 0.703 and 0.653. These p-values do not pass the commonly accepted levels of significance. That said, the LOWESS regression (See Figure 27) shows there is a potential positive relationship. Meaning, airlines that are members in the Star Alliance are more likely to avoid or embrace Taiwan on their route maps. The LOWESS graph shows an apparently strong relationship, and yet the OLS and Oprobit regression show a lack of significance. I suspect the reasoning behind these conflicting results is the LOWESS graph being heavily skewed; because there was not one airline that denied Taiwan on its route map in this study's sample, the slope appeared stronger.

See Figure 27 below: Lowess regression on Star Alliance membership and route map treatment of Taiwan

The *Oneworld Alliance member* variable in both the OLS and Oprobit regressions shows substantially more significance—0.030 and 0.013. Both p-values pass the 95% confidence level, indicating an acceptable level of statistical significance. The coefficient for this variable was also negative, indicating a strong negative relationship. Given these findings, we then conducted a LOWESS regression to see if a similar pattern would emerge; as can be seen in Figure 28, the graph only further buttresses the existence of a negative relationship. From the analysis, there is evidence to assert that airlines that are members of the Oneworld Alliance are more likely to avoid or reject Taiwan on route maps.

See Figure 28 below: Lowess regression on Oneworld Alliance membership and route map treatment of Taiwan

Similarly, the *SkyTeam alliance membership* p-values in the OLS and Oprobit regressions met the 95% level of confidence. In fact, the p-value output from the Oprobit regression was 0.009, therefore passing the 99% confidence level. The LOWESS regression corroborates these

findings, showing a negative relationship between the two variables. Again, we find statistical evidence to support the notion that airlines that are members of the SkyTeam alliance are more likely to avoid or deny Taiwan on their route maps.

See Figure 29: Figure 29: Lowess regression on SkyTeam Alliance membership and route map treatment of Taiwan

Ultimately, these findings suggest that though general alliance membership does not greatly impact RMT of Taiwan, specific alliance memberships do. Therefore, we can partially accept hypothesis 3.

4.5 Hypothesis 4

In addition to proposing that alliance membership may impact RMT, we also hypothesized that this impact takes form as a moderating variable. The goal with this hypothesis was to investigate whether alliance membership—general or specific to each alliance—impacts the strength and/or direction of *CP's* impact on *RMT*.

To begin investigating this, OLS (Figure 30) and Oprobit (Figure 31) regressions were conducted looking specifically into the *AA* variable and its interactions with customer preferences (*AICP*). The results from these initial regressions did not provide p-values indicating significance. That said, the coefficients in each regression were negative, indicative of a negative relationship. In context, the regression shows that there is a negative association between *AICP* and *RMT*. This aligns well with previous findings regarding customer preferences. Thus, were it significant, alliance membership may magnify *CP's* impact on *RMT*.

To visualize this potential relationship, a LOWESS graph was generated (see Figure 32). This graph shows an overall negative trend line, which aligns well with what the OLS and Oprobit regressions put forth.

See Figure 32 below: Lowess regression on AICP's impact on route map treatment of Taiwan

It was also of interest to look at the specific alliance interactions—in other words, do the potential alliance membership effects differ depending on the specific alliance? To investigate, additional OLS (Figure 34) and Oprobit regressions (Figure 35) were conducted. The results of these regressions provided similar results. The OLS and Oprobit regressions provided no moderating variables with a statistically significant p-value. That said, it is important to note that the Oprobit regression generated a p-value of 0.272 for the *AICPSAA* variable. This value would equate to becoming significance at a confidence level of 72.8%. This level of confidence, though not standardly interpreted as strong and significant, provides an indication of a potential viable relationship.

Two LOWESS graphs were generated: one measuring *AICPSAA's* impact on *RMT* (See Figure 36) and the other measuring *AICPSTAA's* impact on the *RMT* (See Figure 38). The *AICPSAA* LOWESS graph can be interpreted as a negative relationship, meaning that being a member of the Star Alliance may increase *CP's* negative impact on the *RMT*. Similar results were seen with the *AICPSTAA* graph.

See Figure 36 below: Lowess regression on AICPSAA's impact on route map treatment of Taiwan

See Figure 38 below: Lowess regression on AICPSTAA's impact on route map treatment of Taiwan

Overall, these results indicate that general nor specific alliance membership has a significant moderating impact on the *CP* variable. Therefore, we reject hypothesis 4.

4.6 Hypothesis 5

Similarly to *CP*, we also wanted to investigate if alliance membership—general or specific–has a moderating impact on *OT*.

The OLS (See Figure 30) and Oprobit (See Figure 31) regressions looking at general alliance membership again do not provide evidence for statistical significance. The LOWESS regression investigating *AA's* interaction with *OT* (See figure 33) does not provide any more evidence to suggest that general alliance membership has a moderating effect.

See Figure 33: Lowess regression on AIOT's impact on route map treatment of Taiwan

Again, looking specifically at each major air alliance, no evidence of significance was demonstrated with the OLS (See Figure 34) or Oprobit (See Figure 35) models. That said, the generated LOWESS graphs provided some interesting results. The alliance interaction with owners' taste of a Star Alliance Airline (*AIOTSAA*)—as seen in Figure 37—shows a positive trend line. Meaning, being a member of the Star Alliance may amplify *OT's* impact on the *RMT*.

See Figure 37 below: Lowess regression on AIOTSAA's impact on route map treatment of Taiwan

Similarly, the alliance interaction with owners' taste of a SkyTeam Alliance Airline (*AIOTSTAA*)—as seen in Figure 39—shows a negative trend line. This means that being a member of the SkyTeam airline again amplifies the impact of *OT* on the *RMT*.

See Figure 39 below: Lowess regression on AIOTSTAA's impact on route map treatment of Taiwan

These directionally different trend lines demonstrate differences between the air alliances general *RMT's*, but do not demonstrate membership has a moderating effect. Therefore, we must reject hypothesis 5.

5. Discussion

The following section will discuss the main findings from this study and how the models set forth perform as predictors of route map design.

5.1 Summary of Findings

We were able to accept, fully or partially, hypotheses 1 and 3. Both the OLS and Oprobit regressions for hypothesis 1 passed the 80% significance level, indicating a considerable level of confidence. The linear and LOWESS graphs provided clear evidence of a negative relationship between *CP* and *RMT*. Ultimately, the empirical evidence supports that as a customer base's favorability for China increases, the airline serving said base is more likely to either avoid or deny Taiwan on its route map. These findings further demonstrate the power that a customer's discriminatory preferences have on a firm's product design.

Hypothesis 3, which investigates whether alliance membership impacts how Taiwan is depicted on the route maps, was partially supported. In investigating alliance membership, two approaches were taken: general alliance membership and membership in specific alliances (e.g., Star Alliance, Oneworld, and SkyTeam). General alliance membership looked at whether being a member in an international air alliance had an impact on how Taiwan was depicted. The *AA* variable was significant at the 70% level, which does not pass standard levels of significance. The linear regressions showed a slightly negative relationship which meant that allied airlines were slightly more likely to either avoid or deny Taiwan on the route maps. That said, significance greatly increased when looking at the specific alliances; membership in either the Oneworld or SkyTeam alliances showed significance at the 95% confidence level, indicating high strength. The linear regressions also demonstrated the varying directional relationships between specific alliance membership and its effects on the route map depictions of Taiwan. In

practice, these findings indicate that specific alliances have varying impacts on the route map designs of these airlines. Why some alliances have a more significant impact on *RMT* than others prompts further investigation.

This study did not provide enough empirical evidence to accept hypotheses 2, 4, and 5. Hypothesis 2, which investigated the impact of *OT* on *RMT,* was rejected. The correlations and regressions (OLS and Oprobit) did not demonstrate a strong association between the variables. There was on overall lack of statistical significance. The linear regression visualization showed a potential positive relationship, indicating that airlines with owners who have a taste for Taiwan are slightly more likely to either avoid or embrace Taiwan.

Hypothesis 4 investigated whether the alliance membership variables altered the strength and/or direction—"moderated"—of *CP*'s impact on *RMT*. The OLS and Oprobit regressions generated p-values with low to moderate strength. The LOWESS graphs present clear and directionally varying relationships. That said, overall, there was a lack of evidence that would allow hypothesis 4 to be accepted. Similarly, hypothesis 5 investigated whether alliance membership had a moderating effect on *OT*'s impact on *RMT*. Regressions, again, lacked significance. Because of this, hypothesis 5 was also rejected.

5.2 Findings in Action

The results of this study indicate there are multiple dynamics at play when it comes to how an airline may alter its route map design for politically discriminatory purposes. The empirical evidence in this study provides some support for multiple hypotheses. In addition, though there is not enough statistical evidence to confirm, the other hypothesis showed promise of underlying dynamics at play. Ultimately, airline customers' preferences, owners' tastes, and alliance membership all matter for how an airline depicts Taiwan on its route maps.

To see the value of this empirical evidence, we can review various airlines to see how the empirical evidence aligns with the anecdotal evidence. An interesting airline to examine is Aer Lingus, a state-owned airline based in Ireland. Ireland's China favorability measure is 11, the lowest of any country in our sample. This airline is state-owned, and Ireland does have a de facto Taiwan embassy. The airline is also non-allied. Instead of being a member with one of the three alliances it operates separately, but codeshares selectively with all three. Given these factors, we might predict that Aer Lingus would embrace Taiwan on its route map as 1) customer preference for China is low; 2) owner's taste for Taiwan is high; and 3) the airline is not specifically allied which implies a higher likelihood of embracing Taiwan. The actual route map of Aer Lingus shown below in Figure 22 aligns with these hypotheses.

See Figure 40 below: Online route map of Aer Lingus

An interesting question to then examine is why customer preferences, owners' tastes and alliance membership lean toward a preference for Taiwan over China. What could be the basis of these stances? A brief investigation of past relations between China and Ireland provides some indication of inter-country tensions. VOA (2021) notes the Irish people's discontent with issues surrounding human rights in China. In addition, other tensions have risen due to the recent arrest in China of Irish businessman Richard O'Halloran and a Chinese executive recently sending demands to Ireland's minister of defense to repeal content published within the realm of academia. The Irish government still maintains its public acknowledgment of the One China Policy and continues to build economic relations with China, but also recognizes the importance of maintaining a solid relationship with Taiwan (Cuffe, n.d.). Both the empirical and anecdotal evidence support similar findings.

Another airline to examine is Saudia, a state-owned airline based in Saudi Arabia and a member of the SkyTeam alliance. Saudia's customer preference score was 58.88, indicating a favorable view of China. It is a state-owned airline and Saudia Arabia does have a Taiwan de facto embassy. With these factors, how does this study's model perform in predicting how Taiwan is shown the airline's route map? With the hypothesis set forth the model would predict that Saudia may or may not deny Taiwan on its route map as 1) customer preference for China skews favorable implying a higher likelihood of avoiding or denying rather than embracing Taiwan; but 2) owner's taste for Taiwan is high implying the opposite; and 3) the airline is allied with SkyTeam, which implying a higher likelihood of avoiding or denying rather than embracing Taiwan. The actual route map of Saudia shown below in Figure 23.

See Figure 41 below: Online route map of airline Saudia

As can be seen in Saudia's route map, countries are distinguished and labeled, and yet Taiwan remains unlabeled. This study would classify this as a denier route map. Generally, the hypothesis in this case did well at predicting the route map treatment of Taiwan. The point of weakness for this model appeared to be the significance of *owners' taste*, as Saudi Arabia does have a de facto embassy for Taiwan, yet its airline Saudia does not acknowledge Taiwan on its route map. This case demonstrates that owners' taste is not as strong of a predictor of the route map treatment of Taiwan. These findings align decently well with the anecdotal evidence as current China-Saudi relations can be characterized as strong economically and growing strategically (House, 2021).

As can be seen in these example case studies, the overall model presented through this study indicates that *customer preferences* do have a stronger impact on an airline's route map treatment of Taiwan. In addition, the dynamics surrounding alliance membership also provide

intriguing findings, as we can see there are differences in how different air alliances and their respective member airlines treat Taiwan on route maps. As for the variable of owners' tastes and alliance membership, they have weaker impact on an airline's product design.

6. Conclusion

6.1 Limitations and future research

Data in this study were good, but not perfect. First, data on China favorability were gathered from different periods, not just in 2018.This measure could be improved in future research by attempting to collect multiple measures at different points in time for each country, as an average measure may better reflect the overall sentiments of a country population. On a similar note, this measure would have been strengthened by acquiring all data from one source. In using data from multiple research organizations, the potential error for this measure increased. Future researchers would benefit from having fewer sources for the data, as well as an average sentiment value that is more reflective of country population sentiment over time. That said, this secondary data is hard to come by. This study, to increase the sample size, needed to extrapolate some China favorability data scores for the analysis to be complete. Finally, regarding customer preference measures, the China favorability data gathered was of the general country population. Future research may benefit from finding polling data specific to air travelers. Since data is limited, perhaps a large-scale primary study would be beneficial to gather better data.

Second, the maps gathered and analyzed varied by year rather than just from 2018. Because of this, there could be variability in the results that follow from a mismatch in timing of route map design and customer preferences, owners' tastes, and alliance membership. For example, some airlines may have updated their maps since the demands set by China in 2018. Vaaler & Waldfogel's (2019) initial study did receive press attention and could have triggered

airlines to update their maps to be more neutral. If it were possible to access airlines' internally archived online route maps, future researchers would benefit from a more controlled map sample to reduce such mismatch.

Third and finally, the data for the owners' tastes variable also have room for improvement. There was no measure for owner's tastes at non-state-owned airlines. Future researchers would benefit from either establishing a different type of owners' tastes measure for privately owned airlines or establishing a measure that encompasses all types of airline ownership models.

Future research may also aim to investigate discriminatory product differentiation across other industries such as commercial shipping and other transportation-related industries. In addition, investigating whether we see this occurring in even more-consumer facing industries including the fast-moving consumer goods industry may provide some compelling findings. Ultimately, this study found some empirical evidence to suggest that firms may be influenced by their customers' and owners' discriminatory preferences and tastes. In addition, other alliance members and their discriminatory preferences may have some influence on a firm's product design. These findings provide motivations for further research within the fields of marketing and strategic management; having a deeper understanding on how discriminatory preferences and tastes can have an impact on various factors of the firm, whether intentional or not, will help firms continue to navigate the ever-changing and complex markets in which they function.

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Endnotes

[1] For more information on the International Air Transport Association (IATA) and the airline and location code search database, see https://www.iata.org/en/publications/directories/code-search/?airline.page=3&airline.search=

[2] For more information on the Wayback Machine Archive tool, see https://www.google.com/url?q=https://archive.org/web/&sa=D&source=docs&ust=1648076487578959&usg=AOvVaw3rVBaYOTJey3PGGHQmbQHC

[3] All airlines analyzed had 25+ destinations, apart from Biman Bangladesh Airlines, Bulgaria Air, Donghai Airlines, Middle East Airlines, and TAAG Angola Airlines. A number of these airlines were still analyzed in the Vaaler & Waldfogel (2019) study, and thus were analyzed in this study as well. These airlines all provide geographic diversity and given the relatively small sample size of this study, were important to analyze.

[4] To visit and use the Google trends tool, see https://trends.google.com/trends/?geo=US

[5] The time range of 2004 to 2018 for the Google Trends search was used for two reasons. First, because the sentiment data sourced ranged anywhere from the early 2000s to 2021, it seemed appropriate to widen the time range to provide a more comprehensive view of the customer base for each airline over time. In addition, Google was pulled out from China circa 2010. Because some airlines were based in Mainland China, and because Mainland Chinese were also customers of multiple international airlines, it was important to be able to capture searches within the mainland China region before Google was taken away.

[6] Afrobarometer is a non-partisan, pan-African research institution that conducts public attitude polling across the continent. Data used is mainly sourced from Afrobarometer's 6th round of surveying, which encompasses the 2014/2015 period. To gather data, face-to-face interviews are conducted with 1,200 to 2,400 randomly selected respondents. Random selection is employed at each stage of sampling, and population size is factored into the probability sampling methods. Those sampled are ages 18 and older. The margin of error is at most +/- 2.8% at a 95% confidence level. The sample design is classified as a clustered, stratified, multistage, area probability sample. Given these factors, Afrobarometer was deemed a quality source for data collection. For more information, see https://afrobarometer.org/.

[7] Arab Barometer is a nonpartisan research organization aiming to gain insight into the social, political, and economic attitudes of citizens across the Middle East and North African regions. The Arab Barometer conducts multiple waves of surveys, and the data sourced from this study mainly came from multiple waves, including Wave V and VI. All country surveys are probability samples, with those sampled being 18 or above. Most countries apply multistage sampling methods based on stratification. Interviews are usually conducted face-to-face. Wave V relied on Computer-Assisted Personal Interviewing (CAPI) and had a sample size of 2,400 for most countries. Wave VI included alternative modes like phone surveys and web surveys due to the COVID-19 pandemic, and sample sizes ranged from 720-1212. Arab Barometer states a margin

of error of +/-3 is its standard. Given these factors, Arab Barometer was deemed a quality source for data collection. For more information, see https://www.arabbarometer.org/.

[8] Central Asia Barometer is an independent non-profit research institution investigating topics of public interest. Research is conducted based on the recognized international quality standard of ESOMAR and WAPOR, as well as through strict adherence to multi-level quality controls. The data sourced for this study came from Wave 4, which spanned from November 2nd of 2018 to December 24th of 2018. To obtain nationally representative samples, stratification and cluster sampling were used. A sample size of 1500 was used in each country. Depending on the Wave, qualitative and quantitative approaches are used and include focus group discussions, in-depth interviews, case studies, public opinion polls, computer/tablet assisted personal interviews, computer-assisted telephone interviews, and computer-assisted web interviews. Given these factors, the Central Asia Barometer was deemed a quality source for data collection. For more information, see https://ca-barometer.org/en.

[9] Central European Institute of Asian Studies (CEIAS) is an independent think tank and is a joint venture of the Institute of Asian Studies, Palacky University's project "Sinophone Borderlands — Interaction at the edges" and the Austrian Institute for European and Security Policy. This institute has many pursuits including conducting and publishing its research. One specific project—conducted in partnership with Palacky University/ Sinophone and Riga Stradins University— was a wide-scale study of the public opinion on China in 12 European countries. This study was conducted from September to October 2020. The research sample was representative concerning gender, age, level of education, country region, and settlement density. Specifically, the sample size was 1,552 and included those ages 18 to 70. Data was collected through an online format. Given these factors, the CEIAS was deemed a quality source for data collection. For more information, see https://ceias.eu/ and https://ceias.eu/wp-content/uploads/2021/03/LV-poll-report.pdf.

[10] Chatham House is a think tank dedicated to being a quality source for independent analysis surrounding international affairs. The Chatham House conducted a public opinion poll from April 20th to 30th in 2021. The sample size for this survey was 937 respondents, with the sample following the general structure of Belarus' urban population. The sample was corrected and weighted by gender, age, size of respondents' town of residence, and education level. The polling was conducted using Computer Assisted Web Interviews (CAWI) and therefore was limited to internet users. The margin of error with a 95% confidence level did not exceed 3.2%. Given these factors, Chatham House was deemed a quality source for data collection. For more information, see https://www.chathamhouse.org/ and https://www.chathamhouse.org/sites/default/files/2021-06/2021-06-14-belarusians-views-political-crisis.pdf.

[11] Eurobarometer is a research instrument used by the European Commission, Parliament, and other EU institutions. The Eurobarometer aims to continually monitor public opinion in Europe on various issues. The specific polling data sourced within this study came from both the *Special Eurobarometer 451: Future of Europe* and the *Special Eurobarometer 479: Future of Europe*. Thus, the data gathered came from both 2016 and 2018. The basic sampling design for a Eurobarometer study is a multi-stage, random probability sample. Sampling is based on a

random selection after stratification by population in terms of metropolitan, urban, and rural areas. Depending on the study, questionnaires are used in combination with face-to-face interviews or other modes of interviewing that involve the usage of technology. The sample size for the special Eurobarometer polls sourced in this study usually sat around 1000 for each country, though the sample size was lower or higher on some occasions. Given these factors, The Eurobarometer was deemed a quality source for data collection. For more information, see https://europa.eu/eurobarometer/screen/home, https://data.europa.eu/data/datasets/s2131_86_1_451_eng?locale=en, and https://data.europa.eu/data/datasets/s2217_90_2_479_eng?locale=en.

[12] Gallup is a well-known global analytics and advice firm that continues to collect and analyze an immense amount of data. For this study, a Gallup Poll conducted in July of 2007 was used. The survey consisted of face-to-face interviews with at least 1,000 adults ages 15 and older. The sampling error with a 95% confidence level was +/- 3. This Gallup poll falls within the classification of a Gallup "World Poll." For these polls, Gallup uses a combination of telephone and face-to-face surveys. For telephone interviews, Gallup applies a random-digit-dial method or a nationally representative list of phone numbers. These surveys last around 30 minutes. For face-to-face surveys, the sample is determined using an area frame, surveying randomly selected households. Given these factors, Gallup was deemed a quality source for data collection. For more information, see https://www.gallup.com/178667/gallup-world-poll-work.aspx and https://news.gallup.com/poll/106984/nepalese-see-benefits-ties-india-china.aspx.

[13] Hong Kong Public Opinion Research Institute (HKPORI) was established to collect and study public opinion on multiple topics including intra- and international government and politics. The data sourced for this study had sample sizes ranging from 502 to 504. The standard error of the mean for both polls was 0.1. The sampling errors sat at around +/- 3% and +/- 4% at 95% confidence. In terms of the sampling method, HKPORI utilized a double-stage telephone survey via landline and mobile phone numbers. Weighting is applied to the study via age, gender, education, and economic activity. Given these factors, the HKPORI was deemed a quality source for data collection. For more information, see https://www.pori.hk/pop-poll/feeling-towards-different-governments-en/v003.html?lang=en, https://www.pori.hk/pop-poll/macau-survey-en/beijing-govt-trust.html?lang=en, https://www.pori.hk/about-us.html?lang=en, and https://www.hkupop.hku.hk/english/release/release1539.html.

[14] Ireland Thinks polling is an Irish research firm that works with academics, NGOs, state-bodies, and corporate entities. This study uses data collected from Ireland Thinks' public opinion polls. These polls are collected via a nationally representative sample using propensity score matching and strict rules. These techniques are used to reduce non-response bias. This study utilized data from a May 15 Ireland Thinks poll that had a sample size of 1,237. No other information could be found concerning this firm's methodology. That said, for the purposes of this study, Ireland Thinks was deemed a solid source for data collection. For more information, see https://www.irelandthinks.ie/ and https://www.thejournal.ie/ireland-thinks-china-5442873-May2021/.

[15] ISEAS-Yusof Ishak Institute is a research center studying socio-political, security, and economic trends and developments in Southeast Asia. The data sourced from this institute was

from The State of Southeast Asia: 2021 Survey. This survey was done in partnership with the ASEAN Studies Center. This study was conducted from November 2020 to January 2021. A total of 1,032 respondents participated in the online survey. The sample drew from five categories of affiliation: academic/research; business/finance; government; civil-society-non-governmental/media; and regional/international organizations. No other information could be found concerning this survey's methodology. That said, for the purposes of this study, ISEAS-Yusof Ishak Institute was deemed a solid source for data collection. For more information, see https://www.iseas.edu.sg/wp-content/uploads/2021/01/The-State-of-SEA-2021-v2.pdf and https://www.iseas.edu.sg/about-us/mission/.

[16] Latinobarómetro is a public opinion study that has conducted around 20,000 interviews in 18 Latin American countries. It is an NGO based in Santiago, Chile. The data sourced for this study comes from the Latinobarómetro 2018 survey. The sampling methods applied for this survey include the following: multistage probabilistic sampling with mapping, multi-stage, stratified, probabilistic sampling, and quotas with proportional sampling based on the size of stratum and locality, random sample stratified by population size with quota control. The sample sizes for each country polled ranged from 1000 to 1200. The margin of error ranged from +/-2.8 to +/-3.1 Uruguay, Dominican, given these factors, the Latinobarómetro was deemed a quality source for data collection. For more information, see https://www.latinobarometro.org/lat.jsp, https://www.latinobarometro.org/latContents.jsp, and https://www.latinobarometro.org/latContents.jsp?Idioma=0&CMSID=InformesAnuales&Idioma=0&CMSID=InformesAnuales.

[17] Pew Research Center is a nonpartisan fact tank. It conducts public opinion polling, demographic research, content analysis, and other data-driven social science research. The data sourced for this study came from a series of polls that falls under what PEW classifies as its "Global Indicators Database." The Global Indicators Database compiles data from all of PEW's past Global Attitudes Survey. PEW also provides country-specific methodology information for Global Attitudes Surveys (see here for an example of the country-specific methodology for the 2018 Global Attitudes Survey in Brazil). That said, in general, the global attitude surveys are mostly conducted via telephone interviews but can also be conducted face-to-face. Results are based on national samples. The country-specific sample designs tend to be probability samples with sample sizes sitting at around 1000 and margins of error being around +/-4%. Given these factors, the PEW research center was deemed a high-quality source for data collection. For more information, see https://www.pewresearch.org/about/, https://www.pewresearch.org/global/database/indicator/24/country/jo/, and https://www.pewresearch.org/global/2020/03/09/us-germany-2019-methodology-global-attitudes-survey/.

[18] Terror Free Tomorrow (TFT) is a non-partisan, not-for-profit research institution. This institution has a Center for Public Opinion that conducted a nationwide public opinion survey in Saudi Arabia. Interviews for this survey were conducted by phone from a CATI facility. The sample was a random national sample of 1,004 Saudi Arabian nationals ages 18 and older. The survey was conducted in 2007. The survey has a +/- margin of error at the 95% confidence level. The sample was determined through full random digit dialing techniques. The number of sampling points was chosen in proportion to the size of a province's population. Given these

factors, TFT's survey was deemed a high-quality source for data collection. For more information, see http://www.terrorfreetomorrow.org/upimagestft/TFT%20Saudi%20Arabia%20Survey.pdf and https://www.terrorfreetomorrow.org/template.php?section=AU.

[19] The Americas Barometer is a project from the LAPOP institution at Vanderbilt University. The Barometer is a periodic study of 34 countries in the Western Hemisphere. Stratified nationally representative samples are drawn from each country. Each country survey has a common questionnaire core but also has country-specific questions. Sample sizes for this survey were lower as compared to other institutions' surveys. For example, the sample size for the 2018 survey in Jamaica was 294. That said, for the purposes of this study, the Americas Barometer was deemed a solid source for data collection. For more information, see https://www.vanderbilt.edu/lapop/about-americasbarometer.php and https://public.tableau.com/app/profile/lapop.central/viz/LAPOPV3_1/Combination.

[20] The Arab Opinion Index is a public opinion survey conducted yearly across the Arab world. This series of surveys are run by the Arab Center for Research and Policy Studies located in Doha, Qatar. The data sourced for this study came from the 2019-2020 Opinion Index. This wave of surveys conducted face-to-face interviews. The sampling methodology included a randomized, stratified, multi-stage, self-weighted cluster approach. This provided an overall margin of error between +/- 2 and 3% for each country survey. The samples guaranteed probability proportional to size, and thus ensured representation among various population segments. Sample sizes ranged between 1,500 and 2,500. Those surveyed were aged 18+. Given these factors, The Arab Opinion Index was deemed a high-quality source for data collection. For more information, see https://arabcenterdc.org/resource/the-2019-2020-arab-opinion-index-main-results-in-brief/#section6 and https://arabindex.dohainstitute.org/EN/pages/tool.aspx.

[21] The Center for International and Security Studies at Maryland (CISSM) within the school of Public Policy conducted a public opinion study in September of 2021. This study was based on a probability sample nationally representative telephone survey. The sample size for this survey was approximately 1001. The margin of error was +/- 3.1%. The samples were random digit dialing samples drawn from landline telephones. Stratification was done first by province, then settlement size and type. Interviews were conducted using computer-assisted telephone interviews. Given these factors, CISSM was deemed a high-quality source for data collection. For more information, see https://cissm.umd.edu/sites/default/files/2021-10/Final-Iranian%20Public%20Opinion%20Sept%202021.pdf and https://cissm.umd.edu/.

[22] The International Republican Institute, among other things, conducts qualitative and quantitative research. Its Center for Insights and Survey Research (CISR) leads these efforts. For this study, data was pulled from the CISR's Public Opinion Poll series. The dates for these polls ranged from 2016 to 2020. Data was collected via in-person, in-home interviews, and computer-assisted phone interviews. The sample size ranged from approximately 2000 to 5000. Samples were randomly selected and stratified. Weighting was applied to the samples. The margin of error did not exceed +/- 4.2% at a 95% confidence level. Given these factors, the International Republican Institute was deemed a solid quality source for data collection. For more information, see https://www.iri.org/what-we-do/, https://www.iri.org/wp-

content/uploads/2020/06/final_wb_poll_for_publishing_6.9.2020.pdf, https://www.iri.org/wp-content/uploads/legacy/iri.org/iri_poll_-_august_2020_cleaned_for_release_2.pdf, and https://www.iri.org/wp-content/uploads/legacy/iri.org/wysiwyg/2016-05-10_iri_survey_of_mongolia_public_opinion-_public_deck.pdf.

[23] The Lowy Institute is an independent, nonpartisan international policy think tank. The data for this study was pulled from the "Fiji At Home And In The World: Public Opinion And Foreign Policy" poll from 2011. This survey was a questionnaire, with all interviews being conducted face-to-face. The sample size was 1,032. Respondents were aged 18+. The sample was stratified by ethnicity, gender, age, and location. Starting points and respondents were selected at random. The margin of error is approximately +/- 3.04% at a 95% confidence level. Given these factors, the Lowy Institute was deemed a solid quality source for data collection. For more information, see https://www.lowyinstitute.org/publications/fiji-home-and-world-public-opinion-and-foreign-policy and https://www.lowyinstitute.org/sites/default/files/pubfiles/Lowy_Poll_FIJI_WEB_1.pdf.

[24] The Lowy Institute Global Diplomacy Index indicates the total number of countries that officially recognize Taiwan as a sovereign nation-state. For more information, see https://globaldiplomacyindex.lowyinstitute.org/country_rank.html.

[25] Wikipedia's list of Taiwan de facto embassies: https://en.wikipedia.org/wiki/De_facto_embassy

[26] Linked example of de facto embassy website for Germany: https://roc-taiwan.org/de_de/index.html

[27] For details on airline safety ratings see http://www.airlineratings.com/. For details on rating criteria, see http://www.airlineratings.com/safety_rating_criteria.php.

[28] Locally weighted scatterplot smoothing regression (LOWESS) is a type of regression analysis used when a data set may have noisy data points and/or the relationships among the variables tend to be weaker. The LOWESS regression allows for the visualization of relationships between variables where a linear regression may not. It is non-parametric, meaning it does not assume that data points will fit a specific distribution shape. between variables. Because the relationships among variables for this study are generally weaker, and many of the variables are categorical, using a LOWESS regression was useful in visualizing potential relationships.

[29] Linear Regressions are best for clear linear relationships, in which an explanatory (independent) has a clear positive or negative relationship with the dependent variable. This is not a regression of causation, but an indication of a relationship.

[30] Ordered probit (Oprobit) regressions are best when the dependent variable has some sort of natural categorical relationship. In other words, the dependent variable will fit into some sort of order or fall into certain categories. In this study, the dependent variable *route map treatment of Taiwan* will naturally fall into one of three categories: embrace Taiwan, avoid conflict, or deny

Taiwan. Thus, the oprobit regression was a suitable way to measure potential relationships between the independent and dependent variables.

[31] Pairwise correlations help to provide a high amount of predictive power by identifying groups of highly correlated features and then focusing on a specific group. Because of the copious number of independent variables that were tested in this study, it was beneficial to utilize the pairwise correlation feature.

Figures

Figure 1: Visualization of this study's model

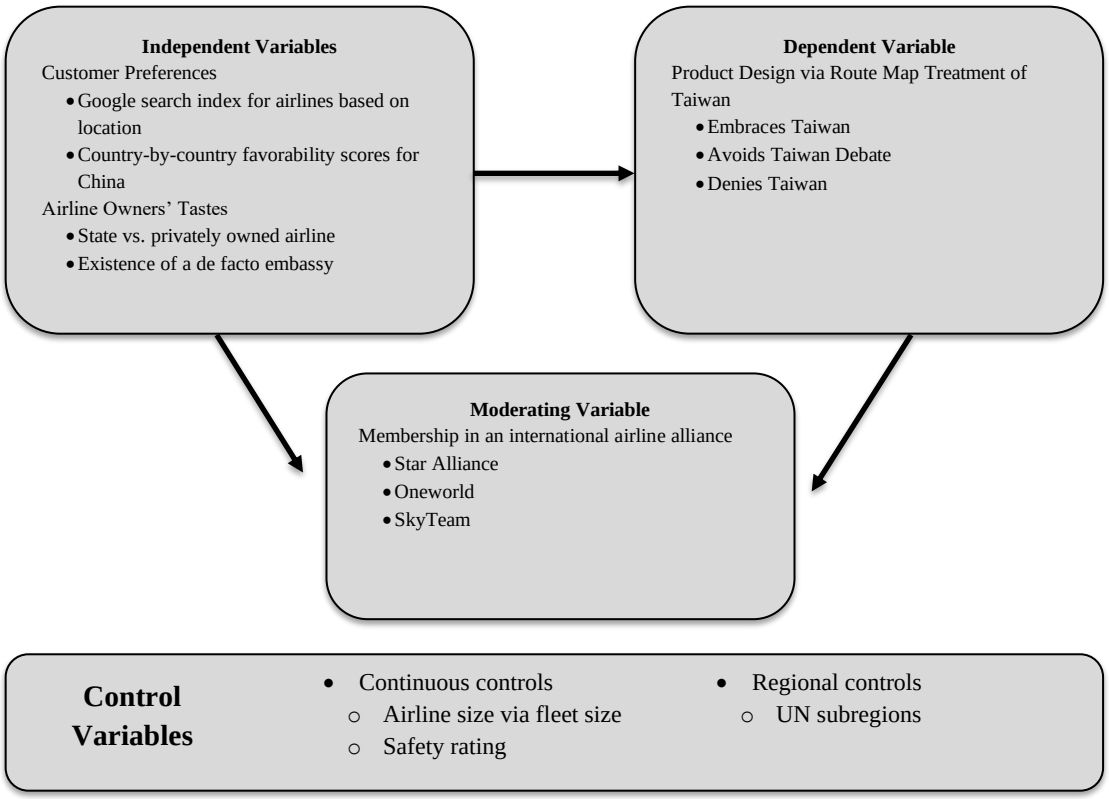

Figure 2: Spectrum of political stance on Taiwan's sovereignty and what this means for route map treatments

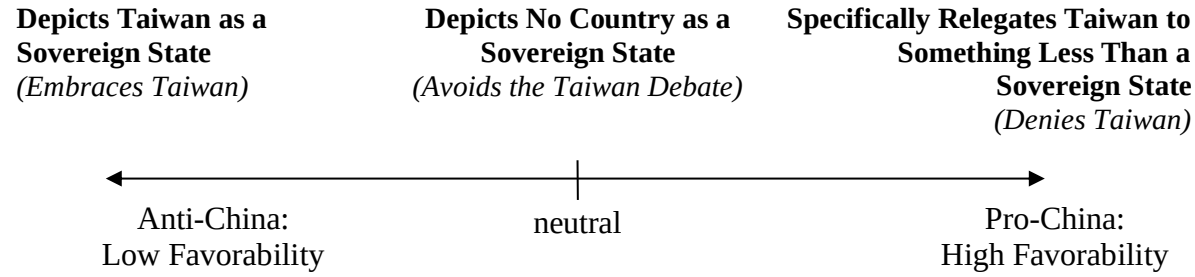

Figure 3: Air Europa's online route map—no countries distinguished

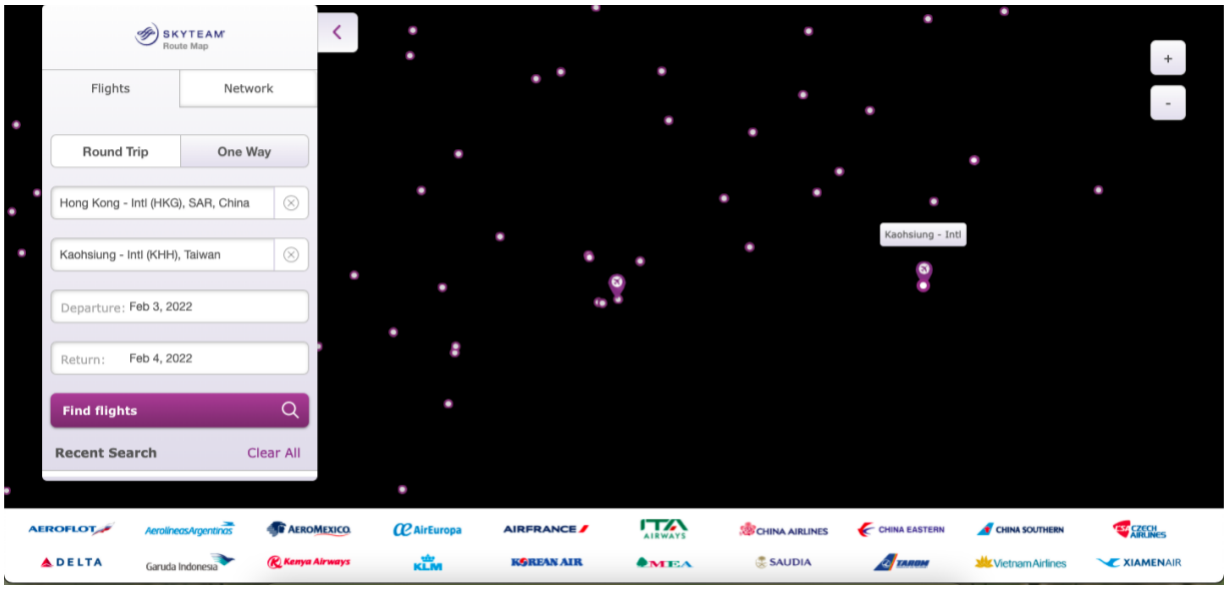

Figure 4: Korean Air's route map—all countries shown, select countries labeled

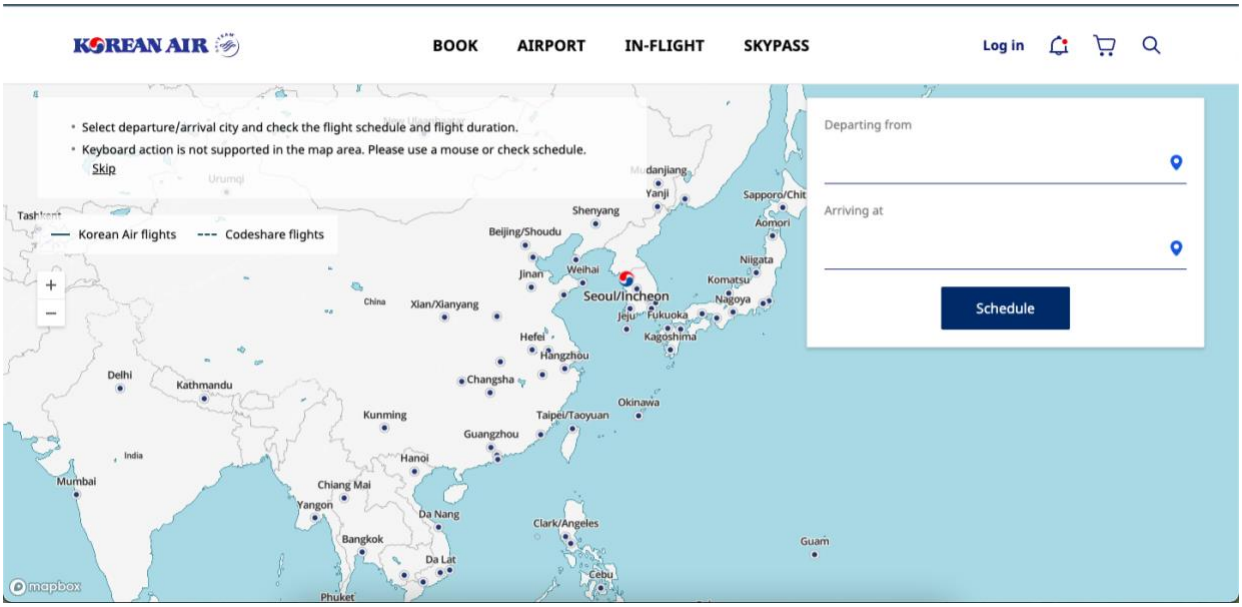

Figure 5: Lufthansa's airline route map—all countries distinguished and labeled

Figure 6: Alaska Air's route map as an example of a Taiwan embracer

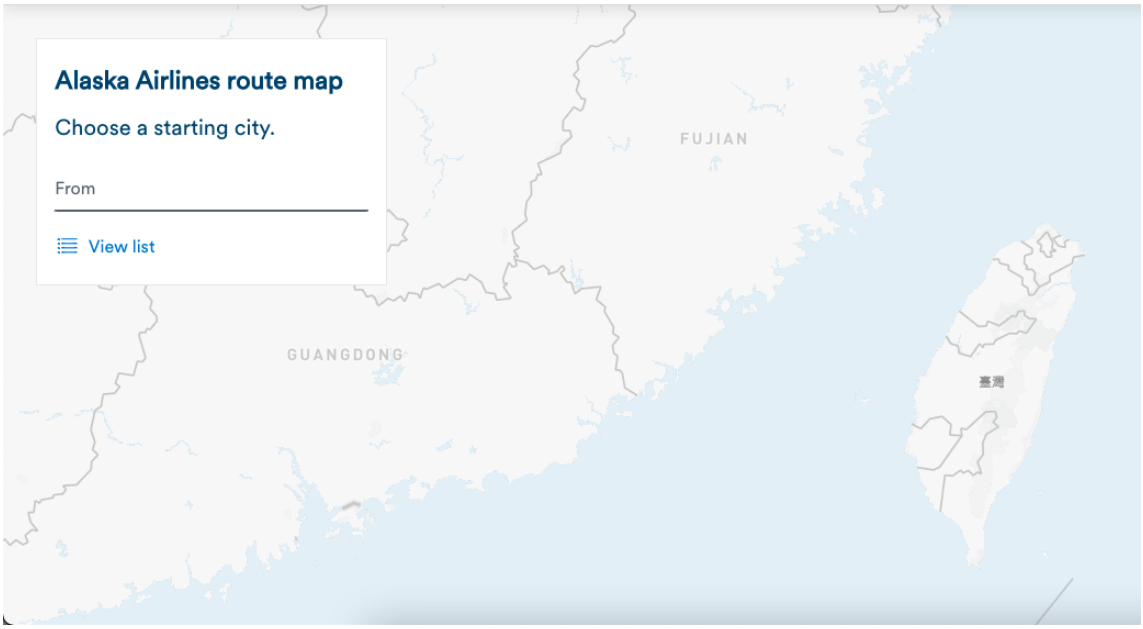

Figure 7: Pakistan International Airlines' route map as an example of an "avoider"

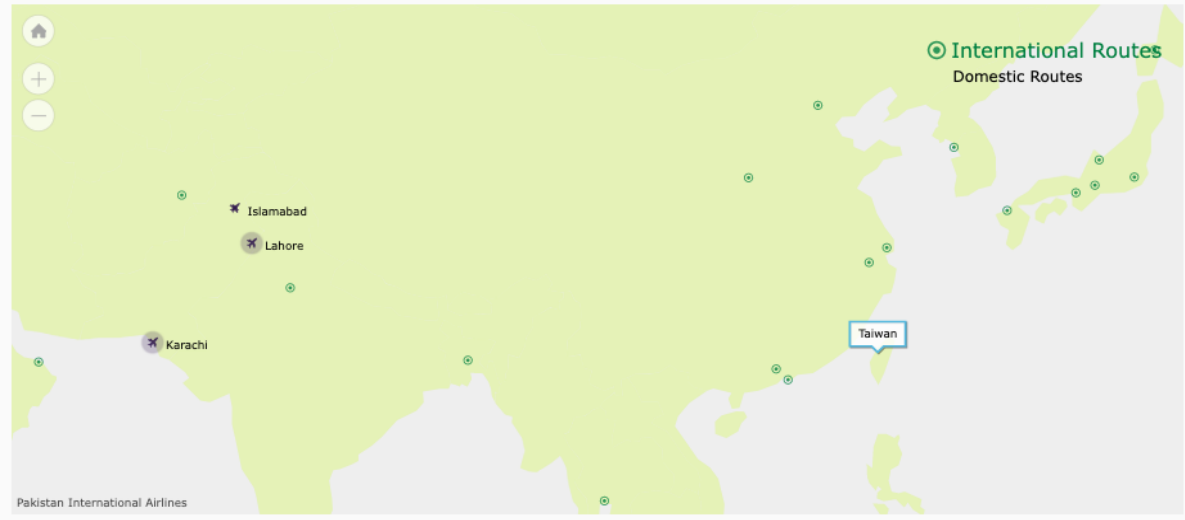

Figure 8: Hawaiian Airlines' route map as an example of a Taiwan denier

Figure 9: Distribution of airlines by alliance, and non-allied if applicable

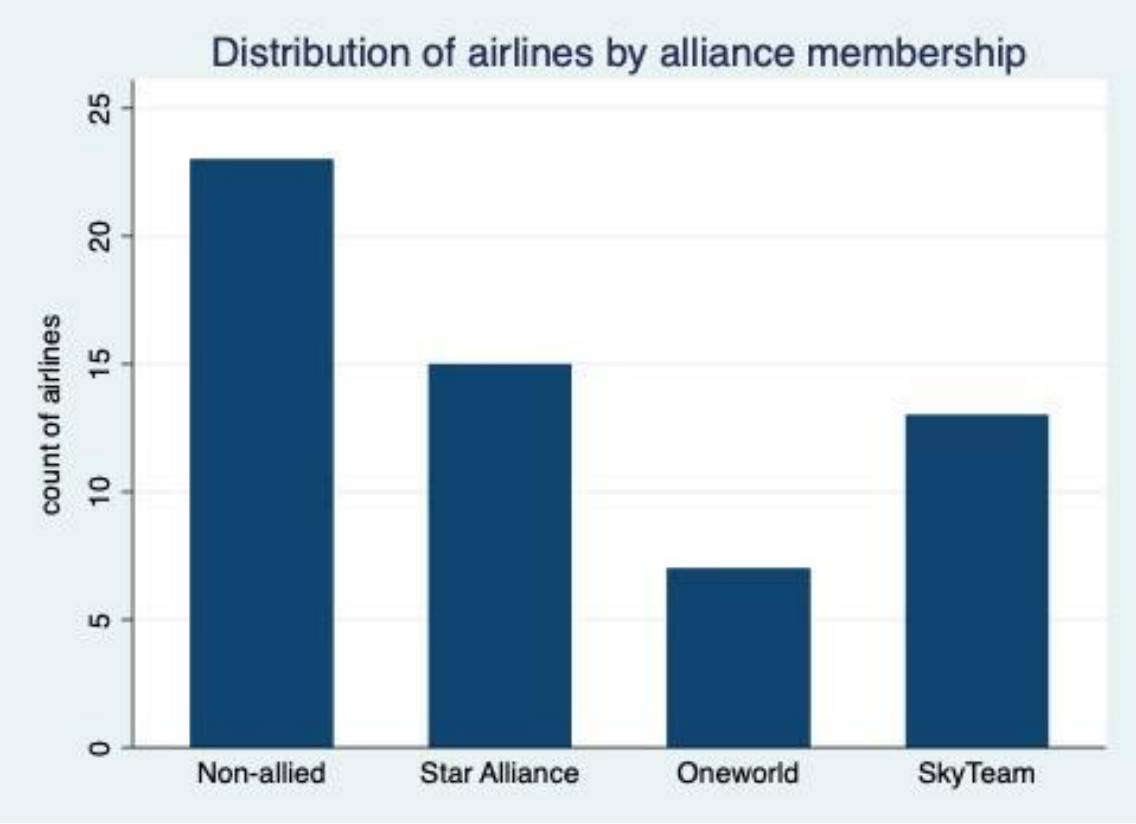

Figure 10: Summary statistics table with all variables of interest measured.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Safety rating	58	6.172	1.523	1	7
Fleet size	58	148.31	197.167	10	951
Log of fleet size	58	1.933	0.443	1	2.978
Capital to capital distance from China (in Kilometers)	58	7272.913	3926.524	0	19263.6
North Africa subregion	58	0.034	0.184	0	1
Sub-Saharan subregion	58	0.034	0.184	0	1
Latin America & Caribbean subregion	58	0.052	0.223	0	1
North America subregion	58	0.121	0.329	0	1
Central Asia subregion	58	0.017	0.131	0	1
East Asia subregion	58	0.121	0.327	0	1
Southeast Asia subregion	58	0.086	0.283	0	1
South Asia subregion	58	0.069	0.256	0	1
West Asia subregion	58	0.086	0.283	0	1
Australia & New Zealand subregion	58	0.034	0.184	0	1
Customer Preferences	58	49.42	10.679	11.302	74.665
Owners' Tastes	58	0.223	0.421	0	1
Route map treatment of Taiwan	58	1.259	0.637	0	2
Allied airlines	58	0.603	0.493	0	1
Star Alliance Member	58	0.259	0.442	0	1
Oneworld member	58	0.121	0.329	0	1
SkyTeam member	58	0.224	0.421	0	1
Alliance interaction with Customer Preferences of allied airlines	58	29.555	25.107	0	70.217
Alliance interaction with Owners' Tastes of allied airlines	58	0.19	0.395	0	1
Alliance interaction with Customer Preferences of Star Alliance Airlines	58	12.560	21.914	0	70.217
Alliance interaction with Customer Preferences of Oneworld Alliance Airlines	58	5.971	16.664	0	66.929
Alliance interaction with Customer Preferences of SkyTeam Alliance Airlines	58	11.024	20.996	0	65.566
Alliance interaction with Owners' Tastes of Star Alliance Airlines	58	0.103	0.307	0	1
Alliance interaction with Owners' Tastes of Oneworld Alliance Airlines	58	0	0	0	0
Alliance interaction with Owners' Tastes of SkyTeam Alliance Airlines	58	0.086	0.283	0	1

Figure 11: Route map treatment of Taiwan approaches by frequency

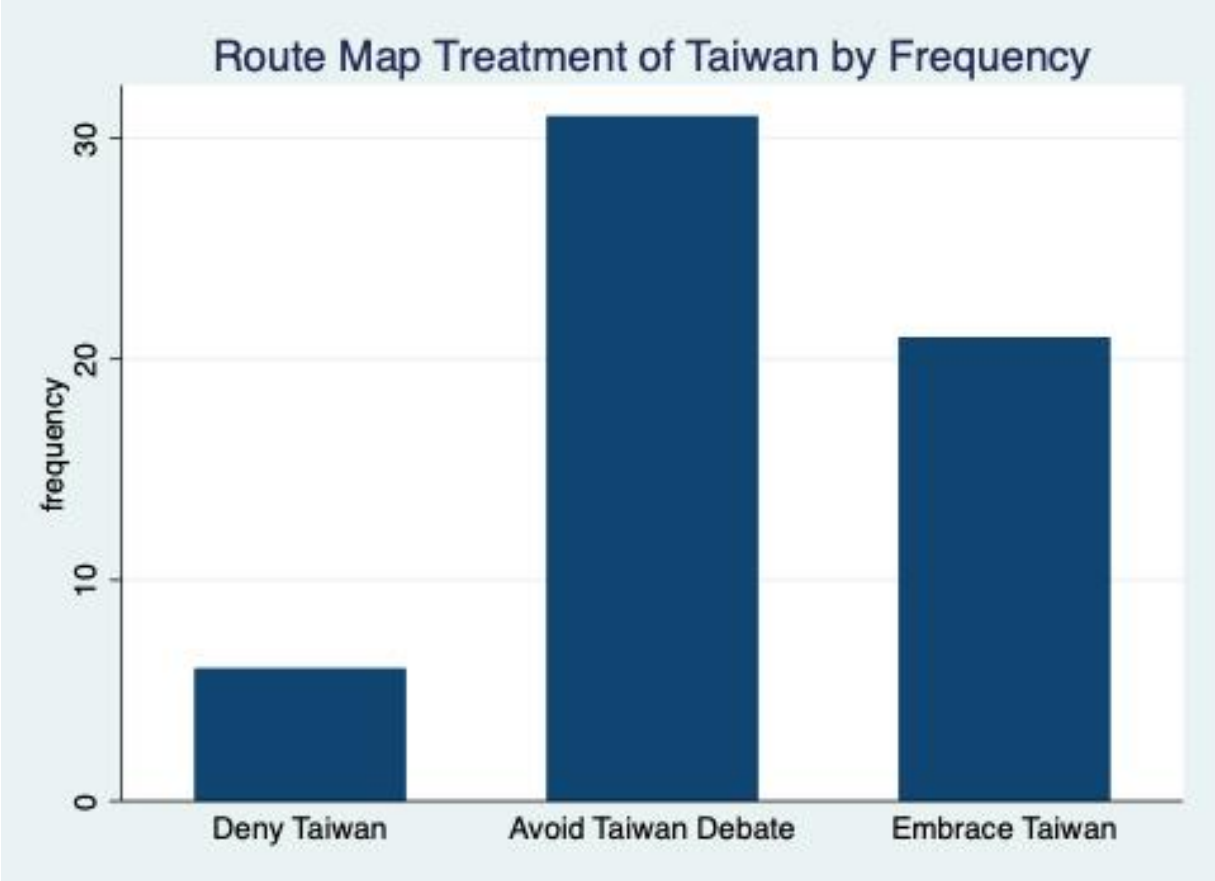

Figure 12: Pairwise correlation between Route map treatment of Taiwan, log of fleet size, and safety rating

	Route map treatment of Taiwan	Log of fleet size	Safety rating
Route map treatment of Taiwan	1		
Log of fleet size	-0.0221	1	
Safety rating	0.1521	0.2422	1

Figure 13: Pairwise correlation between Route map treatment of Taiwan and regional controls

	Route map treatment of Taiwan	North Africa Subregion	Sub Saharan Africa subregion	Latin America & Caribbean subregion	North America subregion	Central Asia subregion	East Asia subregion	Southeast Asia subregion	South Asia subregion	West Asia subregion	Australia & New Zealand subregion
Route map treatment of Taiwan	1										
North Africa Subregion	0.0722	1									
Sub Saharan Africa subregion	0.0722	-0.0357	1								
Latin America & Caribbean subregion	0.0276	-0.0441	-0.0441	1							
North America subregion	-0.0679	-0.0700	-0.0700	-0.0865	1						
Central Asia subregion	-0.0543	-0.0250	-0.0250	-0.0309	-0.0491	1					
East Asia subregion	0.0997	-0.0700	-0.0700	-0.0865	-0.1373	-0.0491	1				
Southeast Asia subregion	-0.2231	-0.0580	-0.058	-0.017	-0.1138	-0.0407	-0.1138	1			
South Asia subregion	-0.1115	-0.0514	-0.0514	-0.0636	-0.1008	-0.0360	-0.1008	-0.0836	1		
West Asia subregion	-0.1258	-0.0580	-0.0580	-0.0717	-0.1138	-0.0407	-0.1138	-0.0943	-0.0836	1	
Australia & New Zealand subregion	0.0722	-0.0357	-0.0357	-0.0441	-0.0700	-0.0250	-0.0700	-0.0580	-0.0514	-0.0580	1

Figure 14: OLS regression for constant and regional variables

Route map treatment of Taiwan	Coefficient	Standard Error	t	P>|t|	95% confidence interval	
Log of fleet size	-0.1004	0.2462	-0.41	0.685	-0.596	0.395
Safety rating	0.1663	0.1040	1.60	0.117	-0.043	0.376
North Africa Subregion	0.8819	0.6967	1.27	0.212	-0.521	2.285
Sub Saharan Africa subregion	0.6129	0.6004	1.02	0.313	-0.596	1.822
Latin America & Caribbean subregion	-0.0331	0.4053	-0.08	0.935	-0.849	0.783
North America subregion	-0.1817	0.3236	-0.56	0.577	-0.833	0.470
Central Asia subregion	-0.3107	0.6826	-0.46	0.651	-1.686	1.064
East Asia subregion	0.0572	0.2889	0.20	0.844	-0.525	0.639
Southeast Asia subregion	-0.4706	0.3369	-1.40	0.169	-1.149	0.208
South Asia subregion	0.1138	0.5036	0.23	0.822	-0.900	1.128
West Asia subregion	-0.3953	0.3345	-1.18	0.243	-1.069	0.278
Australia & New Zealand subregion	0.0696	0.4845	0.14	0.886	-0.906	1.046
y-intercept	0.4615	0.8868	0.53	0.597	-1.284	2.207

Figure 15: Oprobit regression for constant and regional variables

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	-0.218	0.442	-0.49	0.621	-1.084	0.647
Safety rating	0.337	0.191	1.76	0.078	-0.037	0.711
North Africa Subregion	1.843	1.325	1.39	0.164	-0.754	4.440
Sub Saharan Africa subregion	1.356	1.191	1.14	0.255	-0.977	3.690
Latin America & Caribbean subregion	-0.056	0.730	-0.08	0.939	-1.486	1.375
North America subregion	-0.356	0.574	-0.62	0.535	-1.481	0.769
Central Asia subregion	-0.609	1.214	-0.5	0.616	-2.988	1.769
East Asia subregion	0.126	0.525	0.24	0.81	-0.902	1.154
Southeast Asia subregion	-0.910	0.609	-1.5	0.135	-2.104	0.283
South Asia subregion	0.250	0.897	0.28	0.78	-1.507	2.008
West Asia subregion	-0.780	0.597	-1.31	0.191	-1.949	0.389
Australia & New Zealand subregion	0.155	0.890	0.17	0.861	-1.589	1.900

Figure 16: Pairwise correlation between route map treatment of Taiwan and core variables

	Route map treatment of Taiwan	Customer preferences	Owners' Tastes
Route map treatment of Taiwan	1		
Customer preferences	-0.1495	1	
Owners' Tastes	0.0418	-0.0365	1

Figure 17: OLS regression including constant controls, regional controls, customer preferences, and owners' tastes

Route map treatment of Taiwan	**Coefficient**	**Standard Error**	**t**	**P>|t|**	**95% confidence interval**	
Log of fleet size	-0.079	0.246	-0.32	0.748	-0.575	0.416
Safety rating	0.164	0.104	1.58	0.121	-0.045	0.373
North Africa Subregion	1.034	0.701	1.47	0.148	-0.381	2.448
Sub Saharan Africa subregion	0.848	0.617	1.37	0.177	-0.397	2.092
Latin America & Caribbean subregion	0.040	0.409	0.10	0.923	-0.786	0.865
North America subregion	-0.178	0.328	-0.54	0.590	-0.839	0.483
Central Asia subregion	-0.076	0.697	-0.11	0.913	-1.482	1.329
East Asia subregion	0.133	0.292	0.45	0.652	-0.456	0.721
Southeast Asia subregion	-0.511	0.344	-1.48	0.145	-1.206	0.184
South Asia subregion	0.279	0.513	0.54	0.589	-0.756	1.314
West Asia subregion	-0.427	0.335	-1.28	0.209	-1.102	0.248
Australia & New Zealand subregion	0.111	0.490	0.23	0.823	-0.878	1.099
Customer Preferences	-0.012	0.009	-1.34	0.188	-0.030	0.006
Owners' Tastes	0.180	0.228	0.79	0.434	-0.279	0.639
y-intercept	0.957	0.966	0.99	0.327	-0.991	2.905

Figure 18: Oprobit regression including constant controls, regional controls, customer preferences, and owners' tastes

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	-0.191	0.447	-0.43	0.669	-1.066	0.685
Safety rating	0.349	0.194	1.79	0.073	-0.033	0.730
North Africa Subregion	2.309	1.408	1.64	0.101	-0.452	5.070
Sub Saharan Africa subregion	1.970	1.293	1.52	0.128	-0.565	4.505
Latin America & Caribbean subregion	0.119	0.759	0.16	0.875	-1.368	1.607
North America subregion	-0.370	0.589	-0.63	0.530	-1.523	0.784
Central Asia subregion	-0.124	1.256	-0.10	0.921	-2.586	2.338
East Asia subregion	0.272	0.527	0.52	0.606	-0.761	1.304
Southeast Asia subregion	-1.018	0.635	-1.60	0.109	-2.263	0.226
South Asia subregion	0.637	0.948	0.67	0.502	-1.221	2.494
West Asia subregion	-0.877	0.612	-1.43	0.152	-2.077	0.322
Australia & New Zealand subregion	0.237	0.896	0.26	0.791	-1.520	1.994
Customer preferences	-0.027	0.017	-1.54	0.124	-0.061	0.007
Owners' Tastes	0.364	0.415	0.88	0.38	-0.449	1.177

Figure 19: Scatterplot with linear regression line measuring the relationship between customer preferences and route map treatment of Taiwan

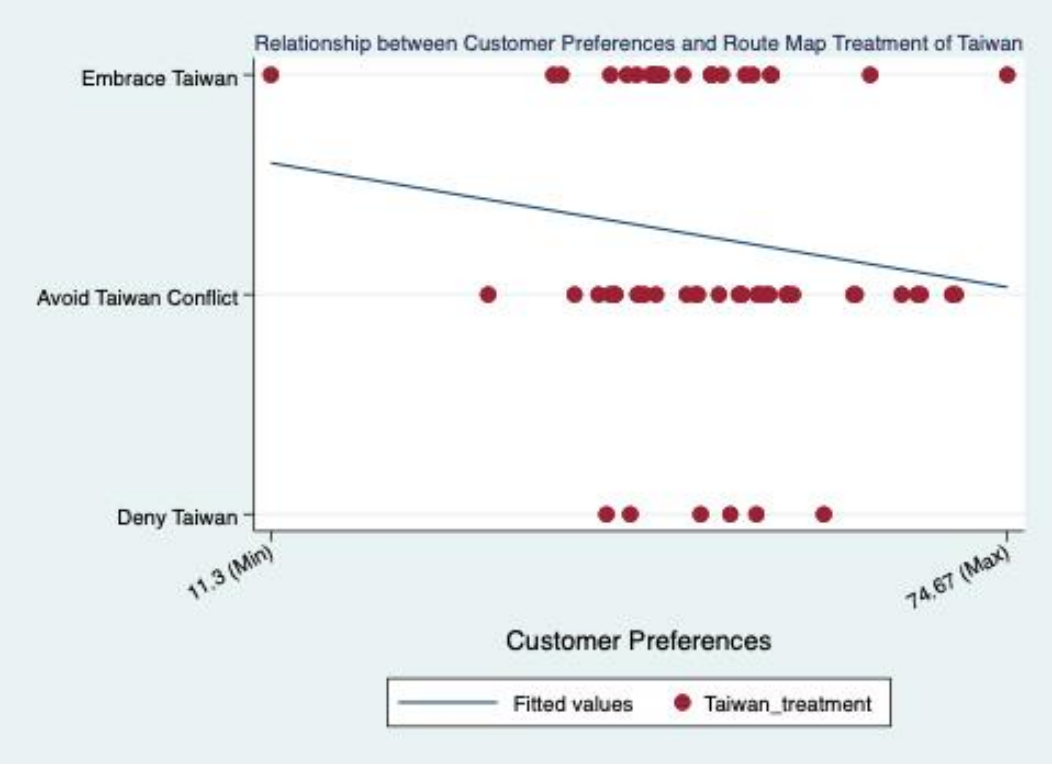

Figure 20: Lowess regression measuring the relationship between customer preferences and route map treatment of Taiwan (with points labeled by airline abbreviation)

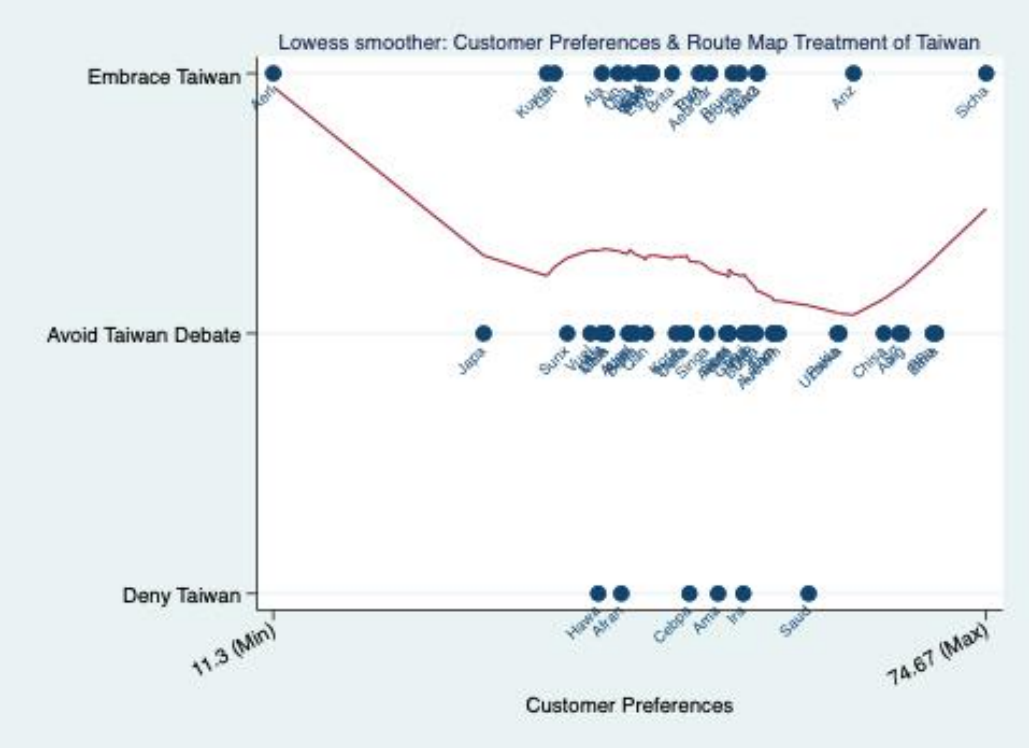

Figure 21: Scatterplot with linear regression line measuring the relationship between owners' tastes and route map treatment of Taiwan

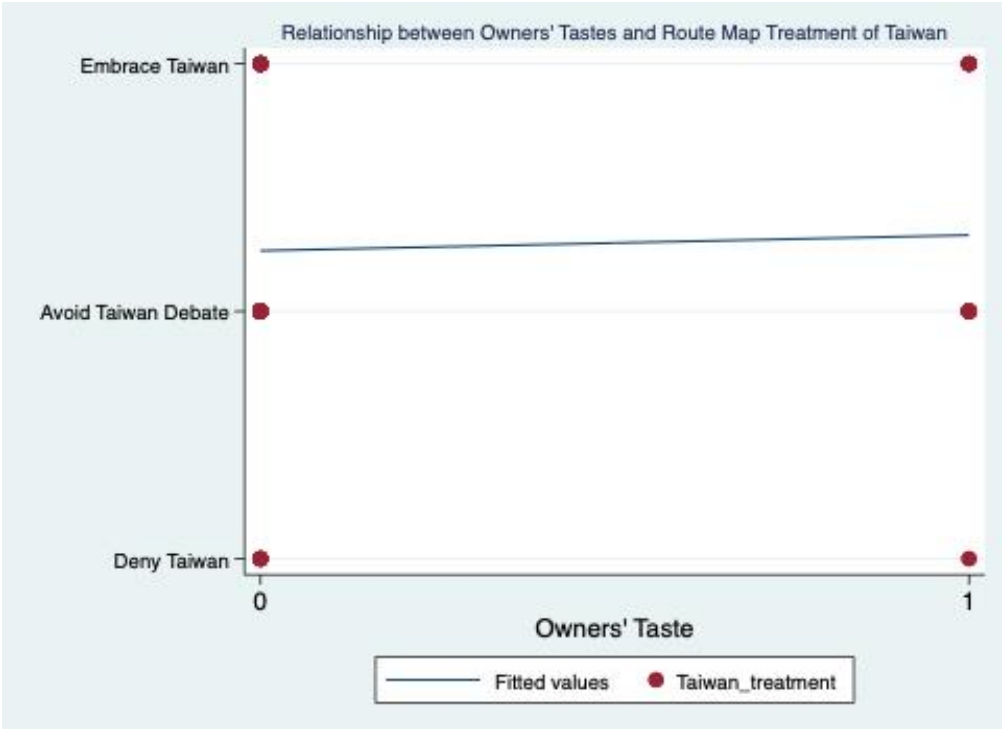

Figure 22: OLS regression including constant controls, regional controls, customer preferences, owners' tastes, and allied airlines

Route map treatment of Taiwan	Coefficient	Standard Error	t	P>|t|	95% confidence interval	
Log of fleet size	0.083	0.286	0.29	0.772	-0.494	0.661
Safety rating	0.167	0.103	1.61	0.115	-0.042	0.375
North Africa Subregion	1.073	0.701	1.53	0.133	-0.341	2.487
Sub Saharan Africa subregion	0.919	0.619	1.48	0.145	-0.331	2.168
Latin America & Caribbean subregion	0.119	0.415	0.29	0.776	-0.718	0.955
North America subregion	-0.267	0.337	-0.79	0.432	-0.947	0.413
Central Asia subregion	-0.123	0.697	-0.18	0.861	-1.529	1.283
East Asia subregion	0.149	0.292	0.51	0.613	-0.440	0.737
Southeast Asia subregion	-0.528	0.344	-1.53	0.133	-1.222	0.167
South Asia subregion	0.283	0.512	0.55	0.583	-0.750	1.317
West Asia subregion	-0.392	0.335	-1.17	0.249	-1.069	0.285
Australia & New Zealand subregion	0.190	0.494	0.38	0.703	-0.808	1.187
Customer Preferences	-0.013	0.009	-1.41	0.167	-0.031	0.006
Owners' Tastes	0.253	0.237	1.07	0.291	-0.225	0.731
Allied airlines	-0.246	0.224	-1.1	0.278	-0.698	0.206
y-intercept	0.785	0.976	0.8	0.426	-1.185	2.755

Figure 23: Oprobit regression including constant controls, regional controls, customer preferences, owners' tastes, and allied airlines

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	0.163	0.529	0.31	0.758	-0.873	1.200
Safety rating	0.361	0.196	1.85	0.065	-0.022	0.745
North Africa Subregion	2.373	1.381	1.72	0.086	-0.334	5.080
Sub Saharan Africa subregion	2.206	1.346	1.64	0.101	-0.432	4.844
Latin America & Caribbean subregion	0.294	0.776	0.38	0.705	-1.226	1.814
North America subregion	-0.585	0.620	-0.94	0.346	-1.800	0.630
Central Asia subregion	-0.228	1.267	-0.18	0.857	-2.710	2.255
East Asia subregion	0.304	0.531	0.57	0.566	-0.736	1.345
Southeast Asia subregion	-1.074	0.637	-1.69	0.092	-2.322	0.174
South Asia subregion	0.650	0.944	0.69	0.491	-1.200	2.500
West Asia subregion	-0.818	0.620	-1.32	0.187	-2.033	0.397
Australia & New Zealand subregion	0.414	0.909	0.46	0.649	-1.368	2.195
Customer preferences	-0.029	0.018	-1.63	0.103	-0.065	0.006
Owners' Tastes	0.521	0.434	1.2	0.23	-0.329	1.371
Allied airlines	-0.542	0.424	-1.28	0.201	-1.372	0.289

Figure 24: Lowess regression on allied airlines and route map treatment of Taiwan

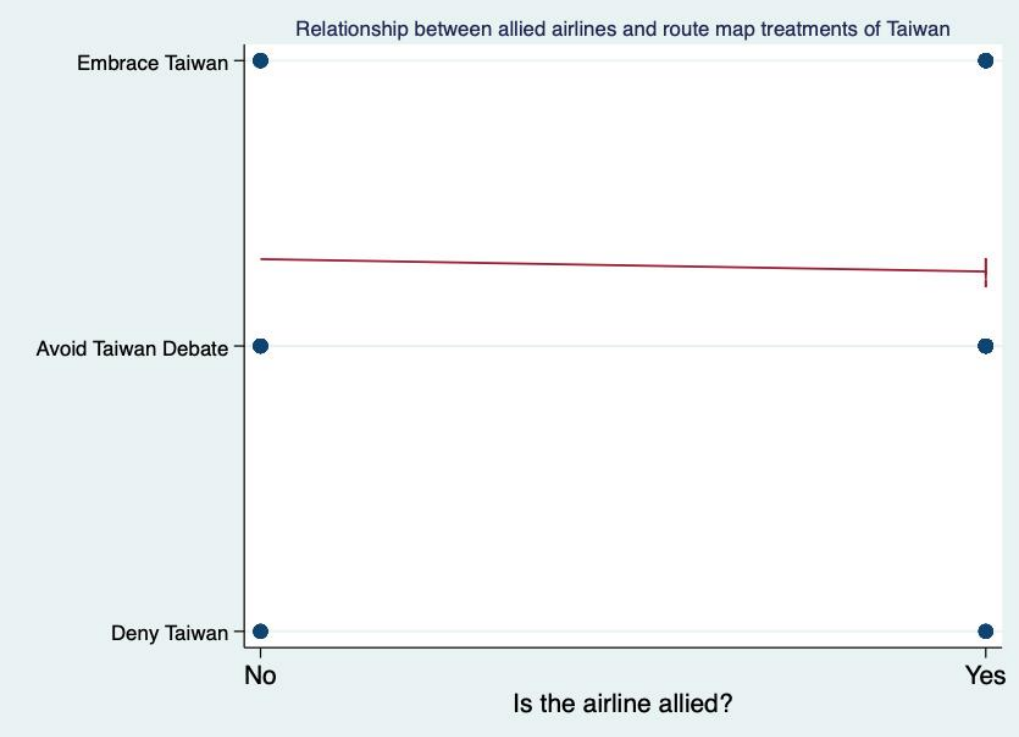

Figure 25: OLS regression including constant controls, regional controls, customer preferences, owners' tastes, and specific air alliances

Route map treatment of Taiwan	Coefficient	Standard Error	t	P>|t|	95% confidence interval	
Log of fleet size	0.247	0.268	0.92	0.362	-0.294	0.788
Safety rating	0.182	0.095	1.93	0.061	-0.009	0.374
North Africa Subregion	0.901	0.643	1.40	0.169	-0.398	2.200
Sub Saharan Africa subregion	0.745	0.568	1.31	0.198	-0.404	1.894
Latin America & Caribbean subregion	0.443	0.393	1.13	0.266	-0.350	1.237
North America subregion	-0.429	0.313	-1.37	0.178	-1.062	0.203
Central Asia subregion	-0.159	0.637	-0.25	0.804	-1.447	1.128
East Asia subregion	0.222	0.270	0.82	0.415	-0.323	0.768
Southeast Asia subregion	-0.588	0.315	-1.87	0.069	-1.224	0.049
South Asia subregion	0.199	0.469	0.42	0.674	-0.749	1.147
West Asia subregion	-0.302	0.310	-0.97	0.336	-0.928	0.325
Australia & New Zealand subregion	0.211	0.464	0.46	0.651	-0.727	1.149
Customer Preferences	-0.011	0.008	-1.34	0.187	-0.028	0.006
Owners' Tastes	0.126	0.227	0.56	0.581	-0.333	0.586
Star Alliance member	0.079	0.229	0.35	0.730	-0.383	0.542
Oneworld member	-0.718	0.318	-2.26	0.030	-1.362	-0.075
SkyTeam member	-0.620	0.260	-2.39	0.022	-1.146	-0.095
y-intercept	0.387	0.901	0.43	0.670	-1.435	2.208

Figure 26: Oprobit regression including constant controls, regional controls, customer preferences, owners' tastes, and specific air alliances

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	0.654	0.586	1.12	0.264	-0.494	1.802
Safety rating	0.441	0.205	2.15	0.032	0.038	0.844
North Africa Subregion	2.272	1.494	1.52	0.128	-0.657	5.201
Sub Saharan Africa subregion	1.841	1.279	1.44	0.150	-0.665	4.347
Latin America & Caribbean subregion	1.078	0.832	1.30	0.195	-0.551	2.708
North America subregion	-1.155	0.683	-1.69	0.091	-2.494	0.184
Central Asia subregion	-0.345	1.355	-0.25	0.799	-3.001	2.310
East Asia subregion	0.548	0.584	0.94	0.348	-0.596	1.692
Southeast Asia subregion	-1.402	0.674	-2.08	0.037	-2.723	-0.082
South Asia subregion	0.507	1.017	0.50	0.618	-1.485	2.500
West Asia subregion	-0.727	0.644	-1.13	0.259	-1.989	0.535
Australia & New Zealand subregion	0.580	1.059	0.55	0.584	-1.495	2.655
Customer preferences	-0.030	0.019	-1.53	0.127	-0.067	0.008
Owners' Tastes	0.276	0.474	0.58	0.561	-0.654	1.206
Star Alliance member	0.225	0.502	0.45	0.653	-0.758	1.209
Oneworld member	-1.754	0.705	-2.49	0.013	-3.136	-0.372
SkyTeam member	-1.511	0.578	-2.62	0.009	-2.643	-0.379

Figure 27: Lowess regression on Star Alliance membership and route map treatment of Taiwan

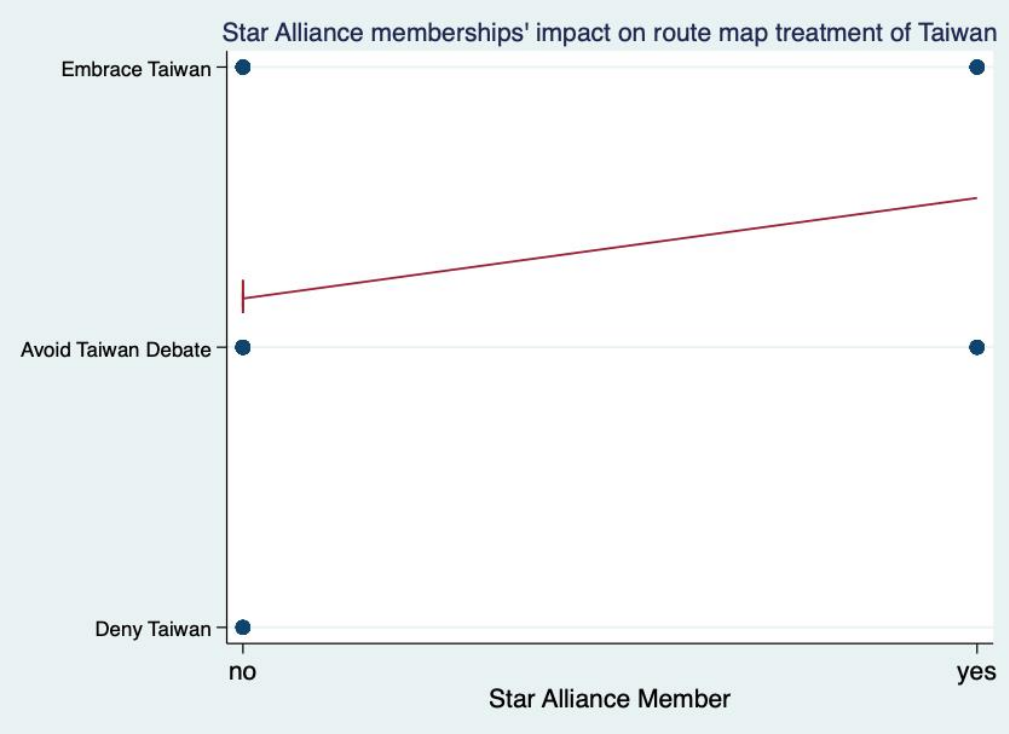

Figure 28: Lowess regression on Oneworld Alliance membership and route map treatment of Taiwan

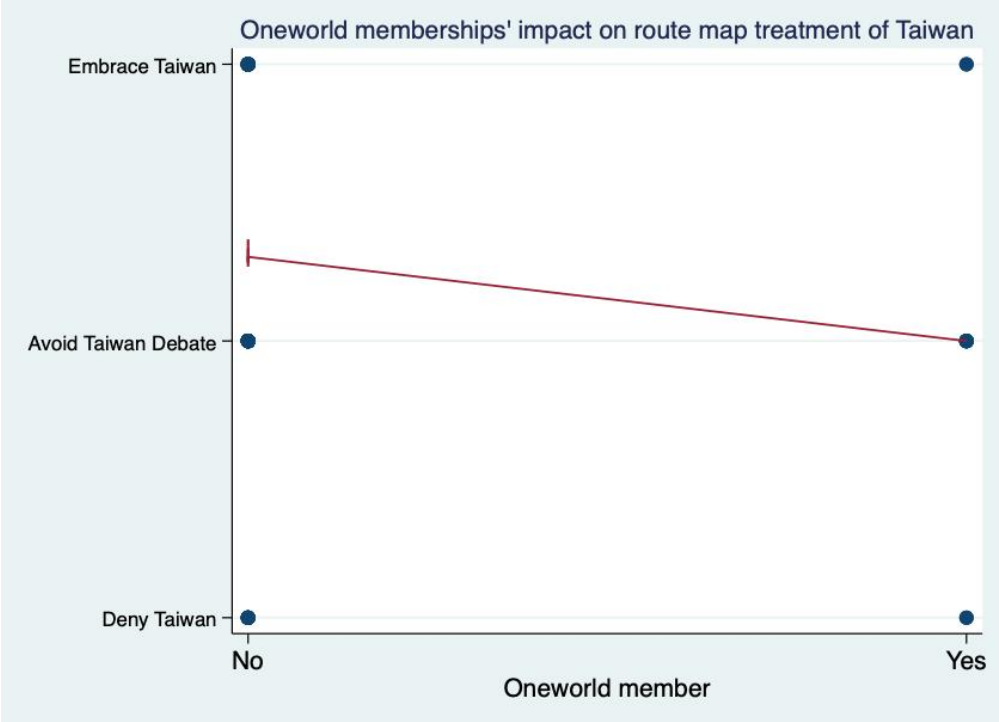

Figure 29: Lowess regression on SkyTeam Alliance membership and route map treatment of Taiwan

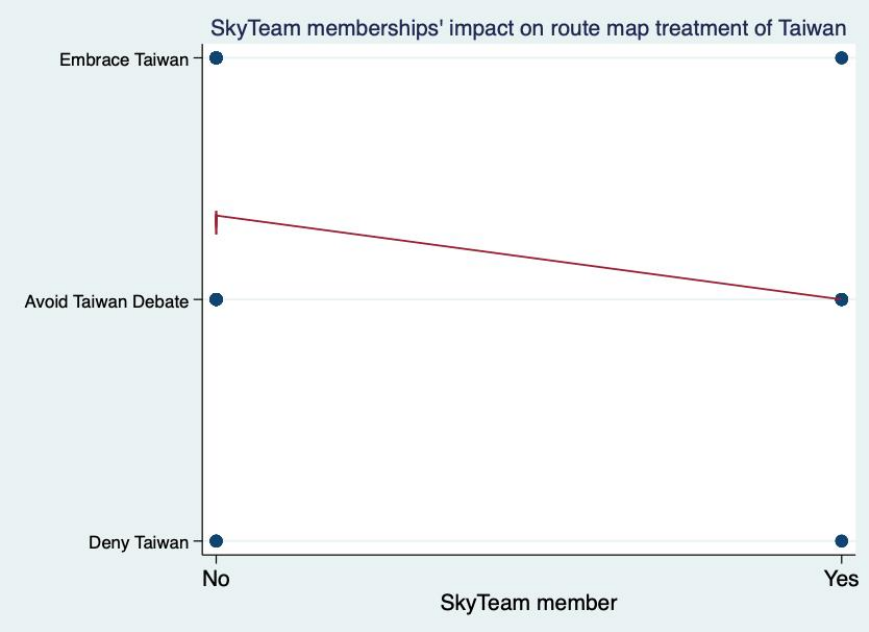

Figure 30: OLS regression including constant controls, regional controls, customer preferences, owners' tastes, and allied interaction

Route map treatment of Taiwan	Coefficient	Standard Error	t	P>|t|	95% confidence interval	
Log of fleet size	0.106	0.295	0.36	0.722	-0.491	0.702
Safety rating	0.168	0.106	1.58	0.122	-0.047	0.383
North Africa Subregion	1.037	0.730	1.42	0.163	-0.438	2.511
Sub Saharan Africa subregion	0.974	0.639	1.52	0.135	-0.318	2.267
Latin America & Caribbean subregion	0.142	0.426	0.33	0.741	-0.718	1.002
North America subregion	-0.282	0.345	-0.82	0.418	-0.979	0.415
Central Asia subregion	-0.178	0.720	-0.25	0.806	-1.634	1.277
East Asia subregion	0.119	0.305	0.39	0.699	-0.498	0.736
Southeast Asia subregion	-0.549	0.356	-1.54	0.131	-1.269	0.171
South Asia subregion	0.240	0.537	0.45	0.657	-0.845	1.325
West Asia subregion	-0.379	0.352	-1.08	0.288	-1.089	0.332
Australia & New Zealand subregion	0.204	0.507	0.40	0.689	-0.820	1.228
Customer Preferences	-0.010	0.013	-0.75	0.456	-0.035	0.016
Owners' Tastes	0.130	0.535	0.24	0.81	-0.951	1.210
Allied airline	0.138	0.961	0.14	0.887	-1.804	2.080
Allied interaction with Customer Preferences	-0.009	0.019	-0.45	0.657	-0.048	0.030
Allied interaction with Owners' Taste	0.174	0.598	0.29	0.773	-1.035	1.382
y-intercept	0.604	1.086	0.56	0.581	-1.591	2.799

Figure 31: Oprobit regression including constant controls, regional controls, customer preferences, owners' tastes, and allied interaction

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	0.203	0.535	0.38	0.705	-0.846	1.252
Safety rating	0.373	0.199	1.88	0.060	-0.016	0.763
North Africa Subregion	2.337	1.404	1.67	0.096	-0.414	5.088
Sub Saharan Africa subregion	2.427	1.445	1.68	0.093	-0.406	5.259
Latin America & Caribbean subregion	0.352	0.790	0.45	0.656	-1.196	1.900
North America subregion	-0.611	0.622	-0.98	0.327	-1.830	0.609
Central Asia subregion	-0.344	1.291	-0.27	0.790	-2.874	2.186
East Asia subregion	0.248	0.545	0.46	0.649	-0.820	1.317
Southeast Asia subregion	-1.133	0.648	-1.75	0.081	-2.404	0.138
South Asia subregion	0.588	0.970	0.61	0.545	-1.313	2.489
West Asia subregion	-0.783	0.627	-1.25	0.212	-2.013	0.446
Australia & New Zealand subregion	0.432	0.910	0.48	0.635	-1.351	2.216
Customer preferences	-0.023	0.026	-0.89	0.373	-0.075	0.028
Owners' Tastes	0.167	0.961	0.17	0.862	-1.715	2.050
Allied airline	0.160	1.870	0.09	0.932	-3.506	3.825
Allied interaction with Customer Preferences	-0.017	0.038	-0.44	0.662	-0.090	0.057
Allied interaction with Owners' Taste	0.489	1.074	0.46	0.649	-1.616	2.595

Figure 32: Lowess regression on AICP's impact on route map treatment of Taiwan

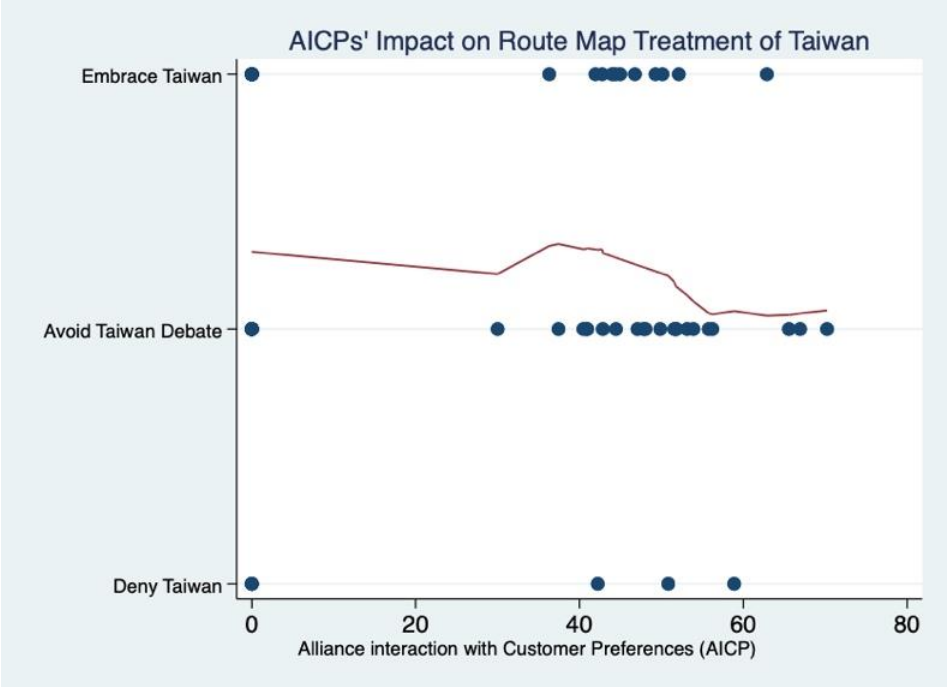

Figure 33: Lowess regression on AIOT's impact on route map treatment of Taiwan

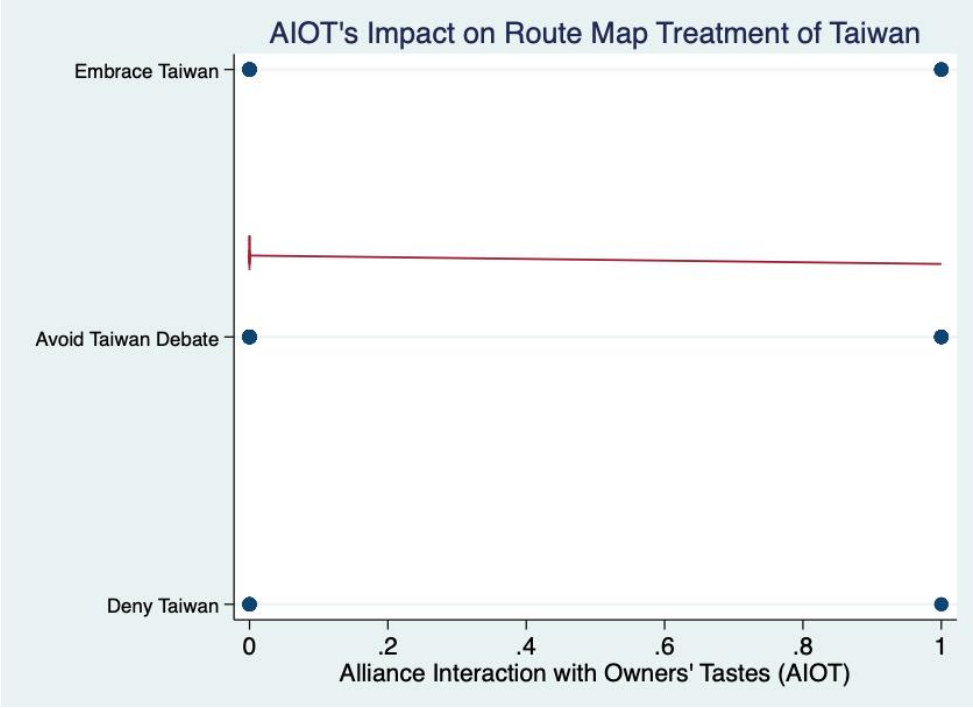

Figure 34: OLS regression including constant controls, regional controls, customer preferences, owners' tastes, and specific air alliances interaction

Route map treatment of Taiwan	Coefficient	Standard Error	t	P>|t|	95% confidence interval	
Log of fleet size	-0.034	0.268	-0.13	0.899	-0.578	0.509
Safety rating	0.160	0.106	1.51	0.139	-0.055	0.374
North Africa Subregion	0.826	0.721	1.15	0.259	-0.635	2.288
Sub Saharan Africa subregion	0.920	0.675	1.36	0.182	-0.449	2.288
Latin America & Caribbean subregion	0.253	0.433	0.58	0.562	-0.624	1.129
North America subregion	-0.240	0.330	-0.73	0.472	-0.909	0.429
Central Asia subregion	-0.119	0.699	-0.17	0.866	-1.536	1.298
East Asia subregion	0.234	0.299	0.78	0.439	-0.373	0.841
Southeast Asia subregion	-0.554	0.355	-1.56	0.127	-1.273	0.165
South Asia subregion	0.148	0.529	0.28	0.782	-0.924	1.220
West Asia subregion	-0.372	0.362	-1.03	0.312	-1.106	0.363
Australia & New Zealand subregion	0.103	0.525	0.20	0.845	-0.960	1.167
Customer Preferences	-0.007	0.011	-0.66	0.513	-0.029	0.015
Owners' Tastes	0.247	0.520	0.48	0.637	-0.807	1.302
Star Alliance member	1.382	1.336	1.03	0.308	-1.324	4.087
SkyTeam member	-0.117	1.379	-0.09	0.933	-2.911	2.676
Star Alliance interaction with Customer Preferences	-0.023	0.028	-0.83	0.409	-0.080	0.033
SkyTeam Alliance interaction with Customer Preferences	-0.004	0.028	-0.16	0.874	-0.061	0.052
Star Alliance interaction with Owners' Tastes	-0.004	0.668	-0.01	0.996	-1.358	1.351
SkyTeam Alliance interaction with Owners' Tastes	-0.083	0.643	-0.13	0.898	-1.385	1.219
y-intercept	0.651	1.047	0.62	0.538	-1.471	2.773

Figure 35: Oprobit regression including constant controls, regional controls, customer preferences, owners' tastes, and specific air alliances interaction

Route map treatment of Taiwan	Coefficient	Standard Error	z	P>|z|	95% confidence interval	
Log of fleet size	-0.106	0.506	-0.21	0.835	-1.098	0.887
Safety rating	0.375	0.208	1.80	0.071	-0.032	0.783
North Africa Subregion	2.057	1.534	1.34	0.180	-0.950	5.065
Sub Saharan Africa subregion	2.567	1.797	1.43	0.153	-0.956	6.090
Latin America & Caribbean subregion	0.545	0.811	0.67	0.501	-1.045	2.135
North America subregion	-0.594	0.616	-0.96	0.335	-1.801	0.614
Central Asia subregion	-0.269	1.321	-0.20	0.839	-2.859	2.321
East Asia subregion	0.525	0.569	0.92	0.356	-0.590	1.641
Southeast Asia subregion	-1.276	0.692	-1.84	0.065	-2.633	0.080
South Asia subregion	0.361	1.033	0.35	0.727	-1.664	2.386
West Asia subregion	-0.905	0.684	-1.32	0.186	-2.245	0.435
Australia & New Zealand subregion	0.291	0.984	0.30	0.767	-1.638	2.220
Customer preferences	-0.017	0.021	-0.79	0.431	-0.058	0.025
Owners' Tastes	0.537	0.947	0.57	0.571	-1.320	2.393
Star Alliance member	3.986	3.001	1.33	0.184	-1.895	9.868
SkyTeam member	-0.387	2.551	-0.15	0.880	-5.385	4.612
Star Alliance interaction with Customer Preferences	-0.070	0.064	-1.1	0.272	-0.195	0.055
SkyTeam Alliance interaction with Customer Preferences	-0.007	0.052	-0.14	0.888	-0.109	0.094
Star Alliance interaction with Owners' Tastes	0.085	1.296	0.07	0.948	-2.455	2.624
SkyTeam Alliance interaction with Owners' Tastes	-0.132	1.171	-0.11	0.910	-2.428	2.163

Figure 36: Lowess regression on AICPSAA's impact on route map treatment of Taiwan

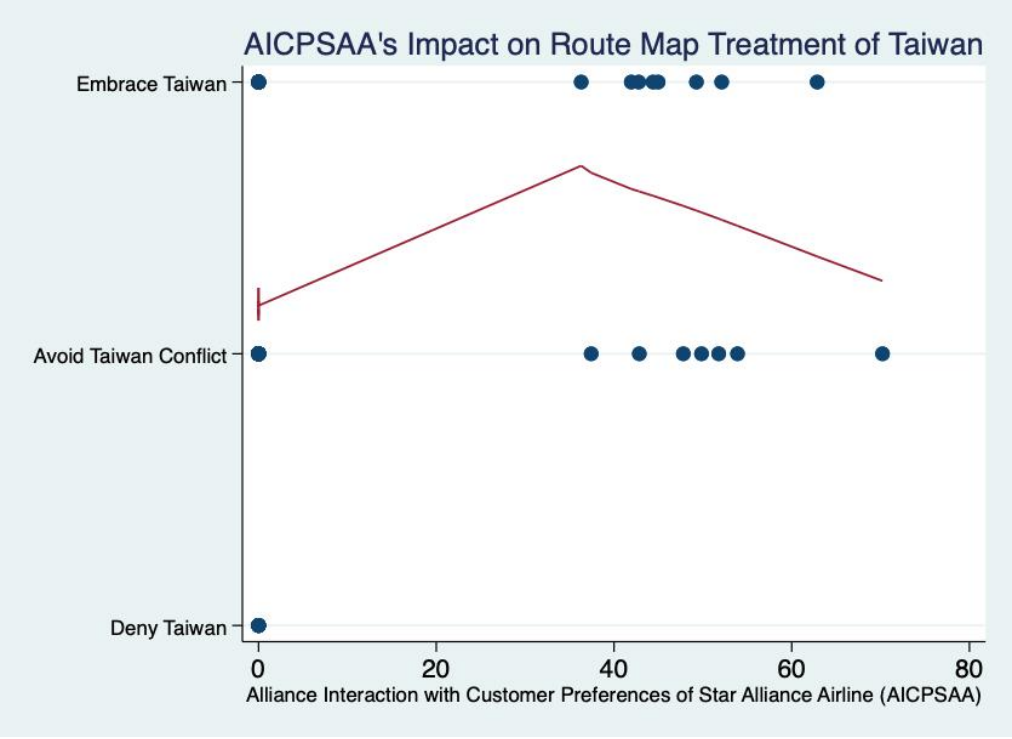

Figure 37: Lowess regression on AIOTSAA's impact on route map treatment of Taiwan

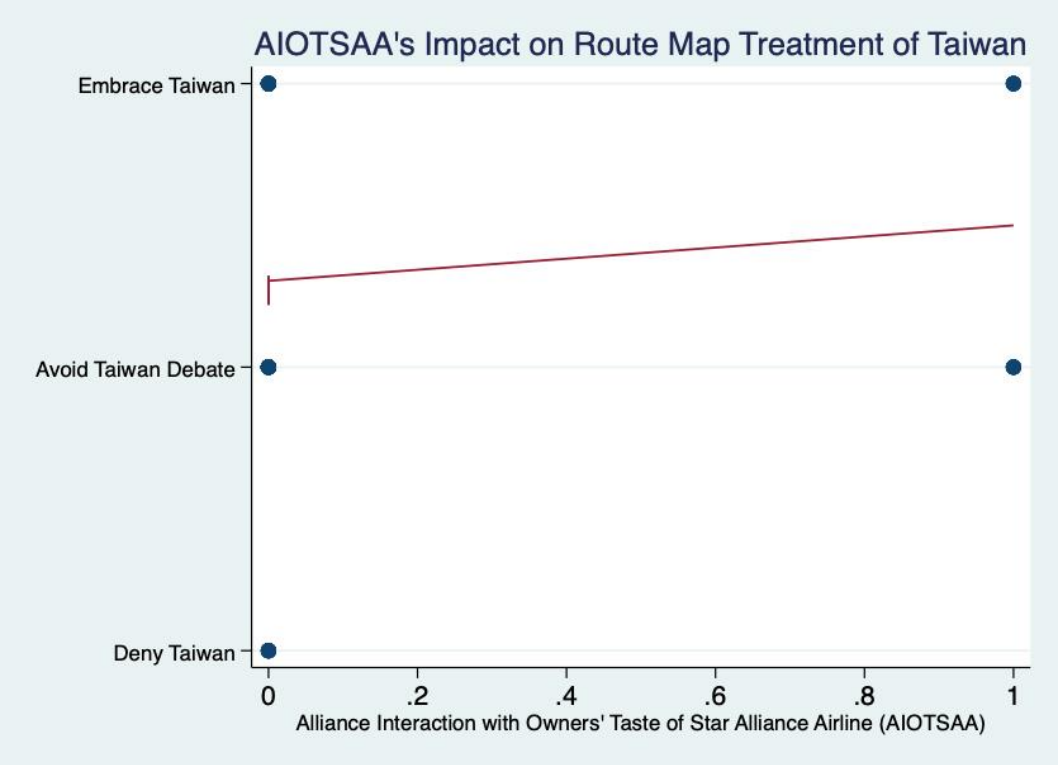

Figure 38: Lowess regression on AICPSTAA's impact on route map treatment of Taiwan

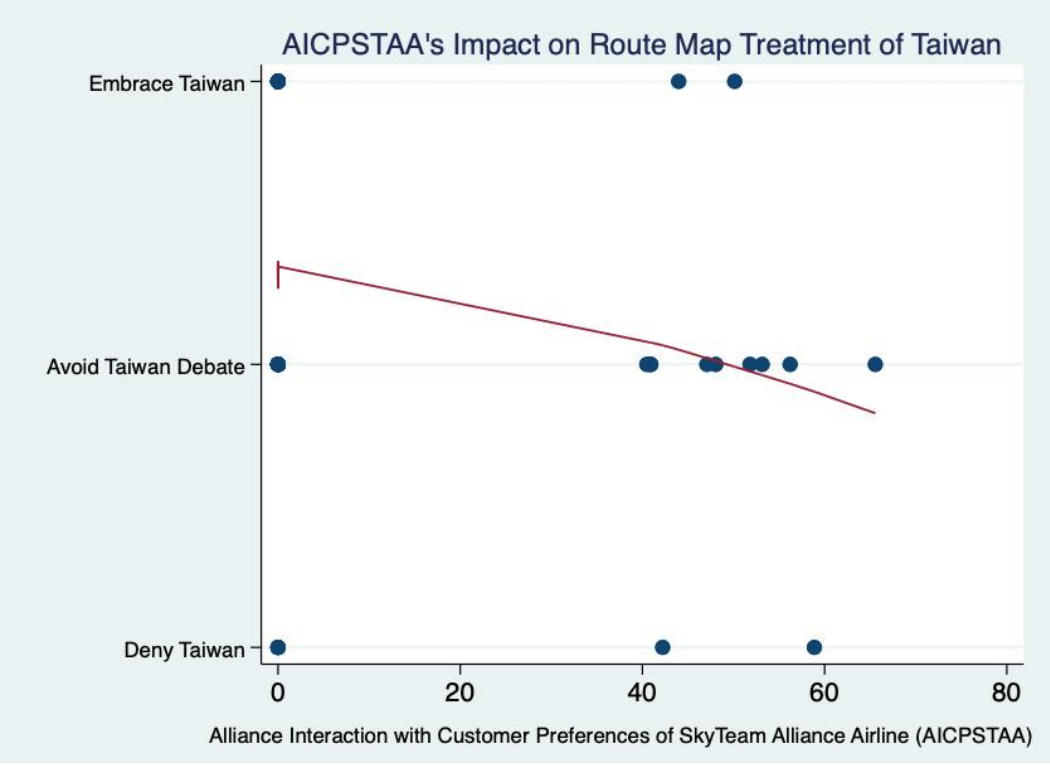

Figure 39: Lowess regression on AIOTSTAA's impact on route map treatment of Taiwan

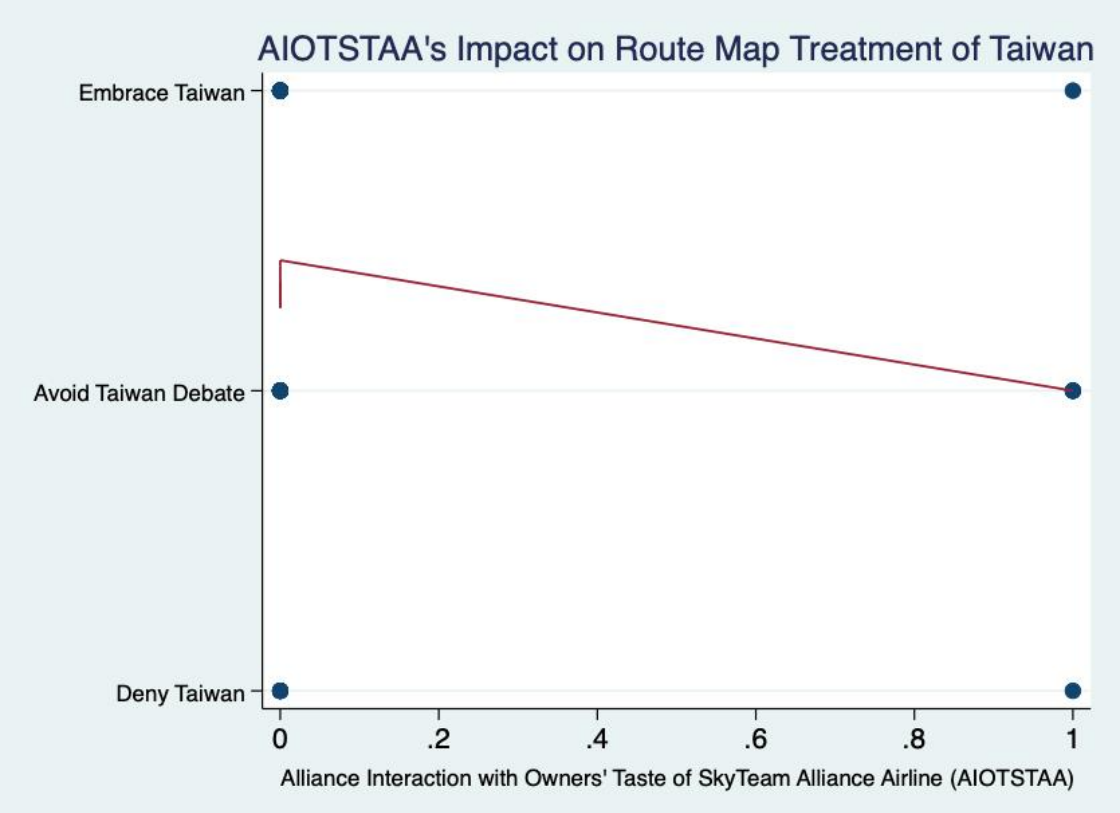

Figure 40: Online route map of Aer Lingus

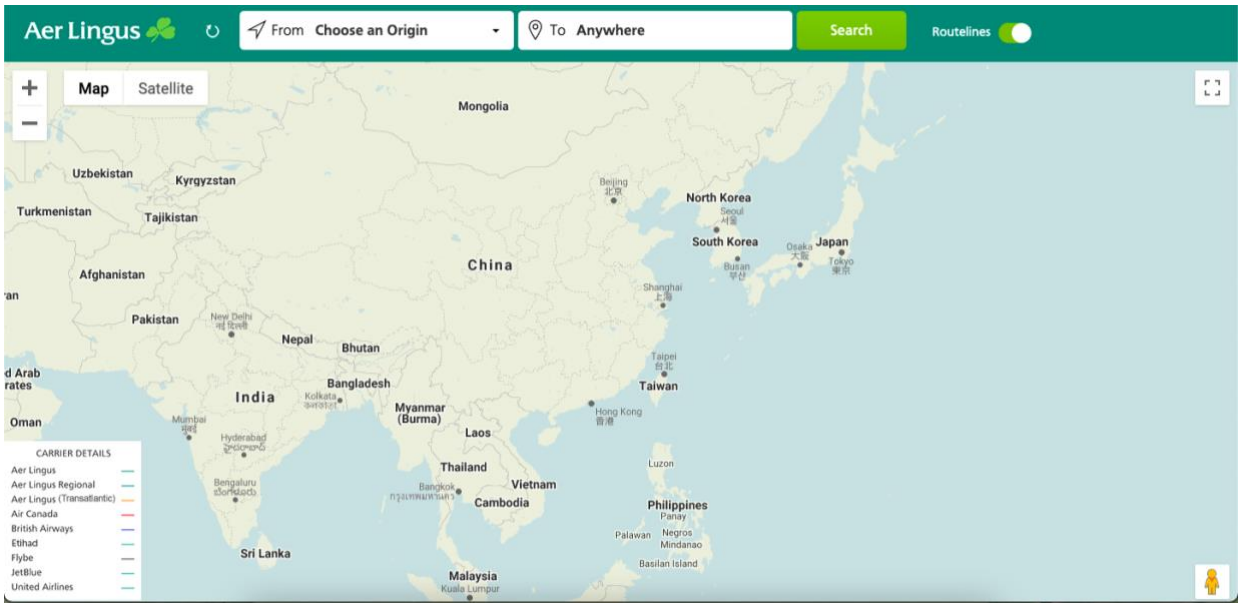

Figure 41: Online route map of airline Saudia

Appendices

Appendix A: Table of airline, headquarters, Taiwan route map treatment, and alliance status

Airline	Headquarters	Map Treatment	Alliance
Aegean Airlines	Greece	Avoid	Star
Aer Lingus	Ireland	Embrace	Non-Allied
Aerolíneas Argentinas	Argentina	Embrace	SkyTeam
Aeroméxico	Mexico	Avoid	SkyTeam
Air Algérie	Algeria	Avoid	Non-Allied
Air Baltic	Latvia	Avoid	Non-Allied
Air Canada	Canada	Avoid	Star
Air Europa	Spain	Avoid	SkyTeam
Air France	France	Deny	SkyTeam
Air India	India	Embrace	Star
Air New Zealand	New Zealand	Embrace	Star
Alaska Air	USA	Embrace	Non-allied
Alitalia	Italy	Avoid	SkyTeam
American Airlines	USA	Deny	OneWorld
Bangkok Airways	Thailand	Avoid	Non-Allied
Biman Bangladesh Airlines	Bangladesh	Avoid	Non-Allied
British Airways	UK	Embrace	OneWorld
Brussels Airlines	Belgium	Embrace	Star
Bulgaria Air	Bulgaria	Avoid	Non-Allied
Cebu Pacific	Philippines	Deny	Non-Allied
China Airlines	Taiwan	Avoid	SkyTeam
China Southern Airlines	China	Avoid	SkyTeam
Delta Air Lines	USA	Avoid	SkyTeam
Donghai Airlines	China	Embrace	Non-Allied
EVA Air +	Taiwan	Embrace	Star
EasyJet	UK	Embrace	Non-Allied
EgyptAir	Egypt	Embrace	Star
Ethiopian Airlines	Ethiopia	Avoid	Star
Flynas	Saudi Arabia	Avoid	Non-Allied
Garuda Indonesia	Indonesia	Avoid	SkyTeam
Hawaiian Airlines	USA	Deny	Non-Allied
Iberia	Spain	Avoid	OneWorld
Iran Air	Iran	Deny	Non-Allied
Japan Airlines	Japan	Avoid	OneWorld
KLM	Netherlands	Embrace	SkyTeam
Korean Air	South Korea	Avoid	SkyTeam

Kuwait Airways	Kuwait	Embrace	Non-Allied
LATAM Airlines Group	Chile	Avoid	OneWorld
LOT Polish Airlines	Poland	Embrace	Star
Lufthansa	Germany	Embrace	Star
Middle East Airlines	Lebanon	Avoid	SkyTeam
Pakistan International Airlines	Pakistan	Avoid	Non-Allied
Qantas	Australia	Avoid	OneWorld
S7 Airlines	Russia	Avoid	OneWorld
Saudia	Saudi Arabia	Deny	SkyTeam
Sichuan Airlines	China	Embrace	Non-Allied
Singapore Airlines	Singapore	Avoid	Star
SunExpress	Turkey	Avoid	Star
TAAG Angola Airlines	Angola	Embrace	Non-Allied
TAP Portugal	Portugal	Avoid	Star
Thai Airways	Thailand	Avoid	Star
Transavia	Netherlands	Embrace	Non-Allied
United Airlines	USA	Embrace	Star
Uzbekistan Airways	Uzbekistan	Avoid	Non-Allied
Virgin Atlantic	UK	Avoid	Non-Allied
Vueling	Spain	Avoid	Non-Allied
West Jet	Canada	Embrace	Non-Allied
Wizz Air	Hungary	Embrace	Non-Allied

Appendix B: Table of China Favorability Scores by Country

Country	China Favorability Score
Algeria	69.9
Angola	54
Argentina	41
Australia	48
Austria	36
Bangladesh	77
Belarus	71
Belgium	24
Benin	70
Bolivia	58
Bosnia & Herzegovina	52
Brazil	49
Brunei	22.9
Bulgaria	55
Burkina Faso	75
Burundi	67
Cambodia	26.7
Cameroon	80
Canada	44
Cape Verde	78
Chile	51
China	95
Colombia	43
Costa Rica	81
Côte d'Ivoire	77
Croatia	63
Cyprus	60
Czechia	50
Denmark	22
Dominican Republic	71.6
Ecuador	70.3
Egypt	46
El Salvador	80
Estonia	45
Ethiopia	75

Fiji	91
Finland	37
France	41
Gabon	78
Germany	39
Ghana	34
Greece	43
Guatemala	82
Haiti	36.2
Honduras	81
Hong Kong	31.3
Hungary	43
India	12
Indonesia	53
Iran	57
Iraq	56
Ireland	8
Israel	55
Italy	29
Jamaica	48.8
Japan	17
Jordan	35
Kazakhstan	68.13
Kenya	70
Kuwait	32.8
Kyrgyzstan	64.9
Laos	13.3
Latvia	42.85
Lebanon	38.2
Libya	38.2
Lithuania	45
Luxembourg	24
Macau	62
Malawi	50
Malaysia	54
Mali	79
Malta	24
Mauritius	72

Mexico	45
Moldova	48
Mongolia	41
Montenegro	68
Morocco	64.7
Mozambique	65
Myanmar (Burma)	16.1
Namibia	66
Nepal	81
Netherlands	47
New Zealand	30
Niger	84
Nigeria	62
North Macedonia	56
Pakistan	82
Palestine	26
Panama	73.7
Paraguay	83.6
Peru	61
Philippines	53
Poland	36
Portugal	36
Qatar	52
Romania	65
Russia	65
Sao Tome & principe	53
Saudi Arabia	61.3
Senegal	55
Serbia	85
Singapore	64
Slovakia	54
Slovenia	45
South Africa	57
South Korea	38
Spain	42
Spain	42
Spain	42
Sudan	63

Suriname	37.1
Sweden	44
Taiwan	35
Tanzania	63
Thailand	72
Togo	72
Trinidad & Tobago	58.5
Tunisia	70
Turkey	37
Turkmenistan	93
Uganda	76
UK	49
Ukraine	57
Uruguay	81.4
USA	38
Uzbekistan	62.2
Venezuela	52
Vietnam	10
Zambia	72

Appendix C: Extrapolated China sentiment scores

Country	Information for assumption	Calculation if necessary	China Sentiment Score	Reasoning
Albania	BRI classifications: Europe and central Asia, Upper Middle Income	Serbia + Montenegro + North Macedonia (85+68+56)/3	69.67	Albania is a part of the BRI initiative and sentiment data is not available, thus we look to other members of BRI that are in the same regional classification and income group. In this case, there are 3. The average of these countries' sentiment scores was taken.
Andorra	Countries close in proximity: Spain, France	Spain + France (42+41)/2	41.5	This country is not part of the BRI initiative; thus, we look to other approaches to extrapolate a sentiment score. In this case, we use proximity as an approach. The assumption here is that countries close to each other may have some similarities in terms of their population's perceptions/feelings on politics, international relations, etc. In this case, there are 2 countries close. So, we take the average of the 2 countries' sentiment scores.
Armenia	BRI classification: Europe & Central Asia, Upper middle income	Belarus + Bosnia & Herz. + Bulgaria + Kazakhstan + Montenegro + North Macedonia + Romania + Russia + Serbia + Turkey (71 + 52 + 55 + 68.13 + 68 + 56 + 65 + 65 + 85 + 37) / 10	62.2	Armenia is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
Aruba	"Owner" of this territory: Kingdom of Netherlands	n/a	47	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status (it is associated with the Netherlands). We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Azerbaijan	BRI classification: Europe & Central Asia, Upper middle income	Belarus + Bosnia & Herz. + Bulgaria + Kazakhstan + Montenegro + North Macedonia + Romania + Russia + Serbia + Turkey (71 + 52 + 55 + 68.13 + 68 + 56 + 65 + 65 + 85 + 37) / 10	62.2	Azerbaijan is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
Bahrain	BRI classification: Middle East & North Africa, High income	Saudi Arabia + Qatar + Kuwait + Malta (61.3 + 52 + 32.8 + 24)/4	42.5	Bahrain is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 4. The average of these countries' sentiment scores was taken.
Barbados	BRI classification: Latin America & Caribbean, High income	Chile + Panama + Trinidad & Tobago + Uruguay (51+73.3+58.5+81.4)/4	66.05	Barbados is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 4. The average of these countries' sentiment scores was taken.
Congo-Brazzaville	BRI classification: Sub-Saharan Africa, Lower middle income	Angola + Cabo Verde + Cameroon + Côte D'Ivoire + Ghana + Kenya + Nigeria + Sudan + Zambia (54+78+80+77+34+70+62	65.56	The Republic of Congo is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 9. The average of these countries' sentiment scores was taken.

		+63+72) / 9		
Congo-Kinshasa (Dem. Rep.)	BRI classification: Sub-Saharan Africa, Low income	Benin + Burundi + Ethiopia + Mali + Mozambique + Niger + Senegal + Tanzania + Togo + Uganda (70 + 67 + 75 + 79 + 65 + 84 + 55 + 63 + 72 + 76) / 10	70.6	The Democratic Republic of Congo is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
Cook Islands	BRI classification: East Asia & Pacific, Upper middle income	Fiji + Malaysia + Thailand (91 + 54 + 72) / 3	72.3	The Cook Islands are a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 3. The average of these countries' sentiment scores was taken.
Curacao	"Owner" of this territory: Kingdom of Netherlands	n/a	47	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status (it is associated with the Netherlands). We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Djibouti	BRI classification: Middle East & North Africa, Lower middle income	Egypt + Morocco + Tunisia (46+64.7+70)/3	60.23	Djibouti is a part of the BRI initiative. Given data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 3. The average of these countries' sentiment scores was taken.
French Guiana	"Owner" of this territory: France Language: Official language is standard French	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments. In addition, French is the dominant language which further buttresses this assumption.
French Polynesia	"Owner" of this territory: France Language: French (official) 73.5%	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches r to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments. In addition, French is the dominant language which further buttresses this assumption.
Gambia	BRI classification: Sub-Saharan Africa, Low income	Benin + Burundi + Ethiopia + Mali + Mozambique + Niger + Senegal + Tanzania + Togo + Uganda (70 + 67 + 75 + 79 + 65 + 84 + 55 + 63 + 72 + 76) / 10	70.6	Gambia is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
Georgia	BRI classification: Europe and central Asia, Lower middle income	Kyrgyz Republic + Moldova + Ukraine (64.9 + 48 + 57)/3	56.63	Georgia is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 3. The average of these countries' sentiment scores was taken.
Guadeloupe	"Owner" of this	n/a	41	This country is not part of the BRI initiative, and thus we must

	territory: France Language: Official language is French			look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments. In addition, French is the dominant language which further buttresses this assumption.
Guam	"Owner" of this territory: U.S.	n/a	38	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Isle of Man	"Owner" of this territory: U.K.	n/a	49	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Jersey	"Owner" of this territory: U.K. Language: English (official) 94.5%, Portuguese 4.6%, other .9% (includes French (official) and Jerriais)	n/a	49	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally aligns with its owners' population's sentiments. In addition, given Jersey is closely located in both the U.K. and France, looking at language is also a good indicator. English is the dominant language which further buttresses the assumption to use the UK sentiment score alone.
Maldives	BRI classification: South Asia, Upper middle-income	Bangladesh + Pakistan (77 + 82) / 2	79.5	The Maldives is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification. In this case, there are 2. As for the income group, there are no other South Asian countries in the upper-middle-income group and thus we used BRI countries within the lower-middle-income groups (the most comparable we could get). The average of these countries' sentiment scores was taken.
Martinique	"Owner" of this territory: France	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Monaco	Language: French (official)	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. For this country, we use language as an approach. The assumption here is that language is a sound indicator of social and/or cultural beliefs. This country has 1 dominant language. So, we take the sentiment score attached to the country with the dominant language.
New Caledonia	"Owner" of this territory: France	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments. In addition, French is the dominant language which further buttresses this assumption.
Norway	Bordering countries:	Sweden + Finland	40.5	This country is not part of the BRI initiative, and thus we must

	Sweden, Finland	37 + 44		look to other approaches to extrapolate a sentiment score. In this case, we use proximity as an approach. The assumption here is that countries close to each other may have some similarities in terms of their population's perceptions/feelings on politics, international relations, etc. In this case, there are 2 countries nearby. So, we take the average of the 2 countries' sentiment scores to extrapolate.
Oman	BRI classification: Middle East & North Africa, High income	Saudi Arabia + Qatar + Kuwait + Malta (61.3 + 52 + 32.8 + 24)/4	42.5	Oman is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 4. The average of these countries' sentiment scores was taken.
Puerto Rico	"Owner" of this territory: U.S.	n/a	38	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Reunion	"Owner" of this territory: France	n/a	41	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Rwanda	BRI classification: Sub-Saharan Africa, Low-income	Benin + Burundi + Ethiopia + Mali + Mozambique + Niger + Senegal + Tanzania + Togo + Uganda (70 + 67 + 75 + 79 + 65 + 84 + 55 + 63 + 72 + 76) / 10	70.6	Rwanda is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
South Sudan	BRI classification: Sub-Saharan Africa, Low income	Benin + Burundi + Ethiopia + Mali + Mozambique + Niger + Senegal + Tanzania + Togo + Uganda (70 + 67 + 75 + 79 + 65 + 84 + 55 + 63 + 72 + 76) / 10	70.6	South Sudan is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 10. The average of these countries' sentiment scores was taken.
Sri Lanka	BRI classification: South Asia, Lower middle-income	Bangladesh + Pakistan (77 + 82) / 2	79.5	Sri Lanka is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 2. The average of these countries' sentiment scores was taken.
St. Helena	"Owner" of this territory: U.K.	n/a	49	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. In this case, we use the territory's ownership status. We measure under the assumption that the population's cultural and/or social beliefs generally align with its owners' population's sentiments.
Switzerland	Language: German (or Swiss German) (official) 62.1%, French (official) 22.8%, Italian (official) 8%	Germany + France + Italy 39+41+29 .621+.228+.08= .929 Germany weight= .668 France Weight= .245	38.6	This country is not part of the BRI initiative, and thus we must look to other approaches to extrapolate a sentiment score. For this country, we use language as an approach. The assumption here is that language is a sound indicator of social and/or cultural beliefs. This country has 3 major languages spoken in its region. There is an attached percentage spoken for each of these languages. So, we

		Italy Weight= .086 (39*.668+41*.245+29*.086)/ (.668+.245+.086)		take a weighted average of the 3 countries and their respective sentiment scores.
Syria	BRI classification: Middle East & North Africa, Low income	Egypt + Morocco + Tunisia (46+64.7+70)/3	60.23	Syria is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. There are no other countries in the low-income group that have sentiment data and thus we used BRI countries within the lower-middle-income groups (the most comparable we could get). Thus, 3 countries are in the same region with relatively close income groups. The average of these countries' sentiment scores was taken.
Tajikistan	BRI classification: Europe & Central Asia, Low income	Kyrgyz Republic + Moldova + Ukraine (64.9 + 48 + 57)/3	56.63	Tajikistan is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. Regarding the income group, there are no other countries in the low-income group that have sentiment data and thus we used BRI countries within the lower-middle-income groups (the most comparable we could get). Thus, 3 countries are in the same region with relatively close income groups. The average of these countries' sentiment scores was taken.
UAE	BRI classification: Middle East & North Africa, High income	Saudi Arabia + Qatar + Kuwait + Malta (61.3 + 52 + 32.8 + 24)/4	42.5	The UAE is a part of the BRI initiative. Given sentiment data is not available, we look for other members of BRI that are in the same regional classification and income group. In this case, there are 4. The average of these countries' sentiment scores was taken.

Appendix D: Table of Customer Preference Scores by Airline

Airline	Customer Preferences
Aegean Airlines	51.78
Aer Lingus	11.30
Aerolíneas Argentinas	50.13
Aeroméxico	56.22
Air Algérie	67.21
Air Baltic	42.99
Air Canada	42.85
Air Europa	51.82
Air France	42.23
Air India	41.94
Air New Zealand	62.87
Alaska Air	40.52
Alitalia	40.48
American Airlines	50.84
Bangkok Airways	43.44
Biman Bangladesh Airlines	69.91
British Airways	46.76
Brussels Airlines	52.12
Bulgaria Air	54.20
Cebu Pacific	48.29
China Airlines	40.93
China Southern Airlines	65.57
Delta Air Lines	48.05
Donghai Airlines	52.76
EVA Air +	49.28
EasyJet	44.16
EgyptAir	44.97
Ethiopian Airlines	70.22
Flynas	55.67
Garuda Indonesia	53.15
Hawaiian Airlines	40.18
Iberia	51.57
Iran Air	53.08
Japan Airlines	30.00
KLM	43.98
Korean Air	47.08
Kuwait Airways	35.62
LATAM Airlines Group	55.77

LOT Polish Airlines	44.39
Lufthansa	36.31
Middle East Airlines	40.87
Pakistan International Airlines	61.42
Qantas	44.45
S7 Airlines	66.93
Saudia	58.88
Sichuan Airlines	74.67
Singapore Airlines	49.85
SunExpress	37.43
TAAG Angola Airlines	54.40
TAP Portugal	53.90
Thai Airways	47.80
Transavia	49.15
United Airlines	42.77
Uzbekistan Airways	61.63
Virgin Atlantic	53.39
Vueling	39.49
West Jet	44.42
Wizz Air	54.28

Appendix E: Table for consolidated owner's taste analysis

Airline	Headquarters	State-owned	De facto Embassy	State-Owned & de facto
Aegean Airlines	Greece	no	yes	no
Aer Lingus	Ireland	no	yes	no
Aerolíneas Argentinas	Argentina	Yes	yes	yes
Aeroméxico	Mexico	No	yes	no
Air Algérie	Algeria	Yes	no	no
Air Baltic	Latvia	Yes	yes	yes
Air Canada	Canada	No	yes	no
Air Europa	Spain	No	yes	no
Air France	France	No	yes	no
Air India	India	No	yes	no
Air New Zealand	New Zealand	Yes	yes	yes
Alaska Air	USA	No	yes	no
Alitalia	Italy	Yes	yes	yes
American Airlines	USA	No	yes	no
Bangkok Airways	Thailand	No	yes	no
Biman Bangladesh Airlines	Bangladesh	Yes	no	no
British Airways	UK	No	yes	no
Brussels Airlines	Belgium	yes	yes	yes
Bulgaria Air	Bulgaria	No	no	no
Cebu Pacific	Philippines	No	yes	no
China Airlines	Taiwan	Yes	yes	yes
China Southern Airlines	China	Yes	no	no
Delta Air Lines	USA	No	yes	no
Donghai Airlines	China	No	no	no
EVA Air +	Taiwan	No	yes	no
EasyJet	UK	No	yes	no
EgyptAir	Egypt	Yes	no	no
Ethiopian Airlines	Ethiopia	Yes	no	no
Flynas	Saudi Arabia	No	yes	no
Garuda Indonesia	Indonesia	Yes	yes	yes
Hawaiian Airlines	USA	No	yes	no
Iberia	Spain	No	yes	no
Iran Air	Iran	Yes	No	no
Japan Airlines	Japan	No	yes	no
KLM	Netherlands	No	yes	no
Korean Air	South Korea	No	yes	no
Kuwait Airways	Kuwait	Yes	yes	yes
LATAM Airlines Group	Chile	No	yes	no

LOT Polish Airlines	Poland	Yes	yes	yes
Lufthansa	Germany	No	yes	no
Middle East Airlines	Lebanon	Yes	no	no
Pakistan International Airlines	Pakistan	Yes	no	no
Qantas	Australia	No	yes	no
S7 Airlines	Russia	No	yes	no
Saudia	Saudi Arabia	Yes	yes	yes
Sichuan Airlines	China	No	no	no
Singapore Airlines	Singapore	Yes	yes	yes
SunExpress	Turkey	No	yes	no
TAAG Angola Airlines	Angola	Yes	no	no
TAP Portugal	Portugal	Yes	yes	yes
Thai Airways	Thailand	Yes	yes	yes
Transavia	Netherlands	No	yes	no
United Airlines	USA	No	yes	no
Uzbekistan Airways	Uzbekistan	Yes	no	no
Virgin Atlantic	UK	No	yes	no
Vueling	Spain	No	yes	no
West Jet	Canada	No	yes	no
Wizz Air	Hungary	No	yes	no