

# Evaluating social marketing efficacy: the case of the Chinese anti-food waste law to reduce food ordering

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## Abstract

**Purpose** – This study aims to determine the effects of three social marketing elements – law (a penalty for excessive waste), education (use of the national Clean Your Plate slogan) and marketing (providing multiple portion sizes) – within the 2021 Chinese Anti-Food Waste Law (CAFWL), to evaluate whether these retailer actions can reduce consumers' food ordering. It assessed three alternative dependent variables related to food ordering – total number of dishes ordered, net number of dishes ordered (accommodating meal size ordered) and total meal cost.

**Design/methodology/approach** – Using a hypothetical food ordering scenario involving 1,609 respondents in China, this study undertook a  $2 \times 2 \times 2$  experiment combining the three elements of social marketing within the CAFWL, to determine the direct and interaction effects of these three elements on the alternative dependent measures of food ordering behaviour.

**Findings** – Each of the three elements of social marketing had a significant main effect, reducing total dishes ordered and net dishes ordered. The education message and penalty for excess food also reduced meal costs. Only the marketing intervention (alternative portion sizes) and a penalty (for excess waste) had a significant interaction across the measures.

**Research limitations/implications** – This study examined food ordering behaviour and did not assess waste. Past research has found that those who order more waste more, and thus there is support that the waste reduction benefits should arise.

**Social implications** – By integrating education, penalties and marketing strategies within the 2021 CAFWL, the findings demonstrate how targeted actions can effectively reduce food waste and influence social norms towards more responsible consumption behaviour.



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**Originality/value** – There have been few attempts to test the efficacy of all three social marketing elements – law, education and marketing – and the interplay among these interventions’ strategies on consumers ordering. This work investigates the efficiency of these elements within the CAFWL and supports its application by using actual consumers in China.

**Keywords** Food ordering, Anti-food waste law, China, Restaurant ordering

**Paper type** Research paper

## Introduction

The issue of food waste is receiving growing attention due to its substantial negative environmental, social and economic impact. Globally, approximately 931 million tonnes of food produced for human consumption is wasted each year. A considerable proportion of this waste – 26% – originates from the food service sector, including restaurants, hotels and catering (UNEP, 2021). In the UK, an average restaurant produces approximately 21 tonnes of food waste annually (Filimonau *et al.*, 2020), while in the USA, this figure ranges from 11 to 34 tonnes of food waste per restaurant, depending on size and location of the restaurant (Shapiro, 2023). Notably, approximately 75% of this waste is categorised as avoidable (Filimonau *et al.*, 2020), underscoring the urgent need for effective intervention strategies.

Within the restaurant setting, food waste occurs in three stages: during food preparation, spoilage in transit and on-site and leftovers on customers’ plates (Filimonau *et al.*, 2020). Two primary factors contributing to food waste from customers’ plates are portion size (Freedman and Brochado, 2010; Greene *et al.*, 2024; Ravandi and Jovanovic, 2019) and menu variety (Block *et al.*, 2016; Chalak *et al.*, 2021; Liu *et al.*, 2022). Many restaurants purposefully serve larger portions to meet customer expectations of value, which often results in more leftovers and, consequently, increases food waste later (Betz *et al.*, 2015). In addition, offering a wide variety of menu options can encourage consumers to over-order, as they may want to try different dishes without intending or being able to consume them fully (Block *et al.*, 2016). Purchasing too much food in a restaurant, defined as “over-ordering”, has been shown to significantly contribute to plate waste in restaurants (Sharma *et al.*, 2021).

Research on strategies to mitigate consumer-based food waste in restaurants, by modifying ordering behaviour has surged in recent years. A substantial body of work has investigated the effectiveness of consumer education and informational programs (Cozzio *et al.*, 2021; Wu and Teng, 2022) or marketing activities (Lee *et al.*, 2024), whereas other studies have focused on government policies and pro-environmental campaigns (Bashir *et al.*, 2018; Long *et al.*, 2024). With other works examining strategies to encourage consumers to reduce waste from over-ordering by taking home restaurant leftovers (i.e. doggy bags) for future consumption (Hamerman *et al.*, 2018), although much of such food taken home is still disposed of as waste later (Talwar *et al.*, 2021), with Aloysius *et al.* (2023), suggesting that people generally bad at leftover food management.

Although progress has been made in intervention practices within restaurant settings to reduce over-ordering and the resulting potential food waste, there are still a few gaps in the literature. First, most of the previous papers concentrated on one or two social marketing tools, yet there is limited research examining the combined impact of three social marketing tools – law, education and marketing, together on reducing over-ordering and the resulting potential food waste. Furthermore, while various governmental interventions target over-ordering and broader food waste on a broader scale (McCafferty, 2022), few regulatory actions specifically target consumer-based behaviours in restaurants. One exception arises in China, where they have had a national program which is designed to motivate people to consume food in restaurants responsibly, including by less over-ordering (Feng *et al.*, 2022).

In 2021 the Chinese Government took further steps by implementing China's Anti-Food Waste Law (CAFWL). This is a multifaceted policy that primarily targets the actions of restaurants and caterers, as well as the customers of these providers.

The goal of the current research is to investigate the influence of three social marketing tools – law, education and marketing – on reducing food waste, by reducing order volumes (and thus providing less opportunity for waste to arise). In this study, education refers to “messages of any type that attempt to inform and/or persuade a target to behave voluntarily in a particular manner but do not provide, on their own, direct and/or immediate reward or punishment” (Rothschild, 1999, p. 25). Marketing refers to attempts to manage behaviour by offering reinforcing incentives and/or consequences in an environment that invites voluntary exchange. Finally, Law involves threatening “with punishment for noncompliance or inappropriate behaviour”. This allows us to assess the efficacy of CAFWL in reducing Chinese consumers' restaurant order intentions.

One contribution of this paper is, first, to address the call by (United Nations, 2015) for urgent action aimed to reduce per capita food waste at the retail and consumer levels by half before 2030. Second, the current research extends our knowledge about social marketing practices that can assist in reducing consumer-based opportunities (i.e. ordering less food within restaurants) for food waste to arise.

## Literature review

### *Food waste mitigation tools*

Preventing food waste has been a focus of research across multiple countries, involving multiple stakeholders and actors within the food supply and waste system (Block *et al.*, 2016; Bolton and Reczek, 2022; Kim *et al.*, 2020a; Sutinen, 2022). In the service sector, studies have explored multifaceted strategies to mitigate food waste, including operational innovations, waste repurposing and consumer behavioural adjustments. For example, from an operational innovation perspective, one potential solution is to distribute edible leftovers to charities for human consumption or to animal shelters for animal feed (Alexander and Smaje, 2008). Furthermore, Papargyropoulou *et al.* (2014) suggested food repurposing in restaurant kitchens to mitigate food loss during preparation. With other works suggesting consumers can take home leftovers and then consume this food later (Talwar *et al.*, 2021). However, while these strategies provide value, the classical food waste hierarchy emphasises the need to prioritise waste prevention over disposal (Papargyropoulou *et al.*, 2016). Therefore, this study focuses on modifying consumer food ordering behaviour in restaurants as a preventative measure, whereby ordering less reduces the opportunity for waste to occur.

Research on food waste interventions has used a range of terminologies and approaches, including penalties, portion control, food format adjustments and informational campaigns. These diverse approaches can be systematically understood through Rothschild (1999) social marketing framework, which categorises interventions into three types: information (education), marketing offerings (marketing) and penalties (law). He also suggested that the applicability of these will depend on the targeted audience's motivation to change behaviours, the opportunity to change behaviours and the ability to respond to the intervention (i.e. MOA). Rothschild (1999) suggested that the tools available could be varied based on whether individuals had or did not have the motivation, ability and opportunities, to modify behaviours. As can be seen in Table 1, in almost all instances, Rothschild (1999) suggested that multiple tools are applicable to bring about behavioural change. His framework as applied to food waste research (Halloran *et al.*, 2014), offers a structured way to understand and evaluate strategies aimed at influencing consumer behaviour to prevent

**Table 1.** MOA and social marketing tools applicability

Motivation	MOA			Tools available	
	Opportunity	Ability	Education	Marketing	Law
Yes	Yes	Yes	X		
Yes	Yes	No	X	X	
Yes	No	Yes		X	
Yes	No	No	X	X	
No	Yes	Yes			X
No	Yes	No	X	X	X
No	No	Yes		X	X
No	No	No	X	X	X

**Source(s):** Adapted from [Rothschild \(1999, p. 31\)](#)

food waste. Therefore, we will use this as a lens to understand the literature and the application of the CAFWL to consumer ordering behaviour.

In terms of food waste, there are many examples where educational and information campaigns have been designed to encourage consumers to behave responsibly and produce less food waste. For example, [Jagau and Vyrastekova \(2017\)](#) conducted a study in university restaurants serving ready-made food, focusing on educational campaigns using banners and posters to highlight the issue of food waste. This intervention urged students to request smaller portions if they anticipated not finishing a regular-sized meal. In a similar study, [Ellison et al. \(2019\)](#) examined the effect of persuasive messaging to inform and shape students' attitudes towards food waste. In another service sector, [Cozzio et al. \(2021\)](#) explored educational interventions at hotel breakfast buffets, emphasising the use of persuasive messages to reduce plate waste. By using messages that framed food waste as an ethical and environmental issue, [Cozzio et al. \(2021\)](#) highlighted the role of soft messaging and moral appeal in shifting consumer attitudes towards waste reduction. [Iriyadi and Puspitasari \(2023\)](#) examined waste intentions in buffet restaurants based on people's awareness of the importance of the issue and how these could be stimulated using norms.

Marketing interventions focus on influencing behaviour by offering choices and incentives that create favourable cost–benefit relationships. [Rothschild \(1999, p. 25\)](#) defined marketing interventions as “attempts to manage behaviour by offering, reinforcing, incentives and/or consequences in an environment that invites voluntary exchange [...] through the development of choices with comparative advantage (products and services), favourable cost-benefit relationships (pricing) and time and place utility enhancement (channels of distribution)”. Within the food service sector, marketing strategies have been applied to modify portion sizes, adjust pricing structures and provide flexible ordering options. For instance, [Filimonau et al. \(2020\)](#) explored the impact of providing smaller portion sizes and offering options to add or remove sides dishes, thus aligning consumer choices with waste-reduction goals. Other studies have examined the effectiveness of charging customers based on the weight of their orders in buffet settings, which discourages over-serving and promotes mindful consumption ([Kallbekken and Sælen, 2013](#)). In addition, [Reynolds et al. \(2019\)](#) highlighted that adjusting plate sizes in hospitality settings can lead to up to a 57% reduction in food waste, demonstrating that such environmental cues are highly effective in influencing portion control and consumption behaviours.

The final intervention suggested by [Rothschild \(1999\)](#) is using the law to regulate behaviour, which “involves the use of coercion to achieve behaviour in a nonvoluntary

manner (e.g., military conscription) or to threaten with punishment for non-compliance or inappropriate behaviour (e.g., penalties for littering)” (p. 25) [1]. The latter part of this definition is important as it highlights “threatening” punishment for non-compliance and within the service sector, the use of regulatory measures or penalties to enforce waste-reducing behaviours. For example, some buffet restaurants implement penalties for uneaten food left on plates, effectively discouraging consumers from over-ordering by imposing financial consequences (Kuo and Shih, 2016; Vizzoto *et al.*, 2021). Chalak *et al.* (2021) further suggested the use of fiscal measures in buffet restaurants such as imposing fines and taxes on customers and restaurants that do not put effort to reduce food waste.

While law represents one of the core approaches to modifying behaviour, few countries have implemented formal laws targeting food waste reduction within the restaurant and on customers’ plates. The exception is China’s recent enactment of the CAFWL, which stands out as one of the few national policies aimed explicitly at reducing food waste through legal mandates (Feng *et al.*, 2022).

### Chinese anti-food waste law

The CAFWL, introduced in 2021, marked a pivotal moment in the nation’s effort to combat food waste and promote resource conservation. The law quickly generated substantial public discourse across China (Huang *et al.*, 2023), drawing attention to both its scope and its challenges in implementation. Notably, some scholars have pointed out gaps in enforcement strategies, with limited clarity on the mechanisms to monitor and uphold compliance (Shen *et al.*, 2024). Despite growing concerns focusing on sustainability and food security, enforcement of these food waste laws has had limited exploration (Feng *et al.*, 2022; Miroso *et al.*, 2018).

The core objective of the CAFWL, outlined in Article 1, explicitly connects food waste reduction to national priorities. The law aims to prevent “food waste, guaranteeing grain security of the state [...] saving resources, protecting the environment and promoting sustainable economic and social development”. The law has broadly defined food waste so that it covers all stages of the supply and consumption system: “Food waste means the failure to reasonably utilise safe edible or drinkable food according to its functions and purposes, including abandonment, or reduction in quantity or deterioration of quality of food due to unreasonable utilisation, among others”. The law contains a wide range of social marketing activities to address food waste across the supply system (see Table 2).

The activities specified in the law can directly be linked to Rothschild’s (1999) three social marketing tools of education, marketing and law (fines or penalties) for organisations and consumers that breach the guidelines. Of those listed in Table 2, this study selected three activities deemed as operational by retailers (restaurants) to address consumer-based responses, in terms of modifying their ordering behaviour and which have previously been assessed in the literature.

### Hypothesis development

Within this study we used three interventions that could be undertaken by restaurants and are linked to the CAFWL and Rothschild’s (1999) three social marketing interventions – education/behaviour change (promotion of Clean Your Plate campaign), marketing (offering different size food portions) and enacting the law (penalties for leaving excess food), as interventions. These interventions can also be linked to the MOA framework. For example, potential effects of penalties for leaving food focuses on people’s motivation not to be fined, whereas offering large and small size portions is related to opportunities and abilities to reduce portion sizes ordered. However, given that multiple social marketing tools are

**Table 2.** Summary of the CAFWL (audiences/scope, activities and classification of intervention)

Audience/scope	Activity	Type of intervention
National, local, business caterers	<ul style="list-style-type: none"> <li>• Serve individual dishes</li> <li>• Disclose food waste information</li> <li>• Promote the Clean Your Plate initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing</li> <li>• Education</li> <li>• Education</li> </ul>
National, state and local governments	<ul style="list-style-type: none"> <li>• Manage grain supply and supply system</li> <li>• Promote healthy eating</li> <li>• Those creating food waste to be reported</li> </ul>	<ul style="list-style-type: none"> <li>• Law</li> <li>• Education</li> <li>• Law</li> </ul>
Public and private organisations, catering services	<ul style="list-style-type: none"> <li>• Develop rules for catering to lead into practising thrift and opposing waste</li> <li>• Develop inspection methods to implement rules</li> <li>• Promote policies in all governmental buildings</li> </ul>	<ul style="list-style-type: none"> <li>• Education/Law</li> <li>• Law</li> <li>• Education</li> </ul>
Catering/restaurants	<ul style="list-style-type: none"> <li>• Better food handling to reduce waste</li> <li>• Remind consumers to limit waste</li> <li>• Modify serving sizes, smaller dishes and limit excess food produced</li> <li>• Do not encourage excess ordering or consumption</li> <li>• Reward not leaving food or charge for leaving excess food</li> <li>• Have healthy options</li> <li>• Provide information on Web pages on food weight, dish size or suggested number of diners to consumers on the platform webpage (for restaurants)</li> <li>• Encouraging consumers to increase waste – fines of 1,000 yuan to 10,000 yuan</li> <li>• Businesses having excessive waste – fines of 5,000 yuan to 50,000 yuan</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Education</li> <li>• Marketing</li> <li>• Education</li> <li>• Marketing</li> <li>• Education</li> <li>• Law</li> <li>• Law</li> </ul>
Canteens/schools	<ul style="list-style-type: none"> <li>• Improve food ordering and production systems</li> <li>• Have different sizes</li> <li>• Have healthy options</li> <li>• Promote anti-waste messaging</li> <li>• Establish an anti-food waste supervision and inspection mechanism</li> <li>• Formulate and implement corresponding reward and punishment measures</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Marketing</li> <li>• Marketing</li> <li>• Education</li> <li>• Law</li> <li>• Law</li> </ul>
Tourism businesses	<ul style="list-style-type: none"> <li>• Promote healthy eating</li> <li>• Encourage appropriate ordering</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Education</li> </ul>
All government bodies	<ul style="list-style-type: none"> <li>• Undertake programs to limit waste</li> <li>• Promote an environment where waste is shameful</li> </ul>	<ul style="list-style-type: none"> <li>• Education/law</li> <li>• Education</li> </ul>
Individuals	<ul style="list-style-type: none"> <li>• Form civilised, healthy, rational and green consumption concepts, and reasonably order and take food in light of their health conditions, dietary habits and dining needs when dining out</li> <li>• Minimise food purchasing and preparation for daily needs</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Education</li> </ul>

(continued)

**Table 2.** Continued

Audience/scope	Activity	Type of intervention
Catering associations	<ul style="list-style-type: none"> <li>• Create self-regulation to implement guidelines</li> <li>• Take necessary self-regulatory measures against members that commit wasteful acts</li> <li>• Promote performance of organisations regarding food waste</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Law</li> <li>• Education</li> </ul>
Consumer organisations	<ul style="list-style-type: none"> <li>• Strengthen food consumption education for consumers and direct them to form the consumption habit of voluntarily resisting waste</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> </ul>
Media	<ul style="list-style-type: none"> <li>• Reduce family food waste</li> <li>• Promote limiting food waste</li> <li>• Highlight food waste</li> <li>• Do not promote excessive eating</li> <li>• Breaching rules could result in fines of 10,000 yuan or more than 100,000 yuan, or business closure</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Education</li> <li>• Education</li> <li>• Education</li> <li>• Law</li> </ul>
ALL	<ul style="list-style-type: none"> <li>• Establish ways to direct excess food to those in need</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> </ul>

**Source(s):** Authors' own creation

suggested to be appropriate in different MOA settings (see [Table 1](#)), we focused on the social marketing tools, rather than motivation, opportunity and ability.

### *Dependent measures*

To investigate the efficacy of the manipulations we need to measure potential changes in the amount of food ordered. While other studies asked people to compare present ordering behaviour with past ordering behaviour ([Yu et al., 2021](#)), this study was focused on changes to the volume of food ordered. A reduction in food ordered means there is less food to potentially waste ([Sharma et al., 2021](#)). Two dependent measures were used to assess the volume of food ordered. The first was a count of the total number of dishes ordered, irrespective of portion size. Given that marketing intervention offers consumers large- and small-sized meals (increasing opportunity to change order behaviour), the second measure was the net number of equivalent full-sized dishes, where half-sized dishes counted as 0.5 of a full-sized dish. We suggest that the net order size is the truest measure of the volume of food ordered, but this opportunity is only available in half of the interventions. We also include the total cost of the meal, based on menu prices, to enable us to comment on potential revenue impacts of alternative interventions for restaurants. This is less relevant to food waste, although if people order less food, they may also save money.

### *Education – information programs*

Education is a core part of the CAFWL. There are extensive studies that have examined how information campaigns can impact on food consumption (e.g. [Chen and Jai, 2018](#); [Volgger et al., 2022](#); [Wyse et al., 2021](#)) and more importantly food waste ([Ellison et al., 2019](#);

Kim *et al.*, 2020b; Reynolds *et al.*, 2019). For example, Chang (2022), found that reminders like “cherish the earth and treasure its food” resulted in Chinese restaurant consumers reducing their food waste. Yu *et al.* (2021) found that messaging by a server, indicating to consumers they ordered too much food, also resulted in lower purchases and thereby less food waste opportunities.

One prominent educational intervention is China’s “Clean Your Plate” campaign, introduced in 2013 to address food waste on a national level (Wang *et al.*, 2022). This campaign was grounded in broad research showing that educational messaging can reduce both food ordering (Yu *et al.*, 2021) and waste (Kim *et al.*, 2020b). However, findings on its effectiveness have been mixed. While some studies noted that mass media exposure to “Clean Your Plate” did not always lead to consistent changes in ordering behaviour (Qian *et al.*, 2024; Wang *et al.*, 2022), even though “Clean Your Plate” is referenced multiple times in the CAFWL (e.g. Articles 7 and 20), other studies offer a more positive outlook. For example, systematic review of this intervention, uncovered an increased awareness of food waste issues, including Chinese university students wasting less food (Wu *et al.*, 2019). In line with this finding, Ding *et al.* (2024) further showed that this message can positively shift behavioural intentions.

Applying Rothschild’s (1999) social marketing framework, we propose that the “Clean Your Plate” campaign should reduce unnecessary ordering behaviours for several reasons. Firstly, it provides motivation by appealing to consumers’ sense of social responsibility around food waste. Second, it creates opportunities for informed decision-making within restaurant settings by encouraging mindful consumption. Finally, it enhances consumers’ ability to make waste-conscious choices by promoting smaller portions and mindful ordering practices. Therefore, we hypothesise that this campaign will reduce unnecessary ordering behaviours by fostering an environment that prioritises mindful consumption. Specifically, we hypothesise:

- H1a-c.* The use of the Clean Your Plate campaign will reduce the (a) number of distinct dishes ordered; (b) number of net dishes ordered; and (c) amount of money spent on a meal.

#### *Marketing initiatives – modifying order and portion size*

The CAFWL includes marketing strategies aimed at reducing food waste, one of which is the modification of offerings by providing consumers with both regular and smaller portion sizes. By presenting consumers with a smaller portion option, the CAFWL encourages mindful ordering and aims to limit waste generated from oversized servings. While the smaller food portion option may appeal to those that prefer smaller meals, the lower prices may also encourage some to try multiple food options, which may lead to more food waste. Former researchers found that varying portion sizes at restaurants can increase both consumption and waste (Wansink and Van Ittersum, 2013). For example, all-you-can-eat buffets result in more food waste (Kasavan *et al.*, 2022). Within the CAFWL, varying portion size by food services is mentioned in articles 7, 9 and 10 as a method for controlling waste.

By using Rothschild’s framework, we suggest that this marketing strategy leverages opportunity by providing choices that enable consumers to align their orders with their needs, potentially minimising waste. The cost–benefit appeal of smaller portions also fosters motivation to order appropriately, as consumers are encouraged to consider smaller, more affordable options rather than larger quantities that may go uneaten.

Thus, based on these insights, we hypothesise the following:

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*H2a-c.* Providing consumers with alternative portion sizes will (a) increase the number of distinct dishes ordered; (b) reduce the number of net dishes ordered; and (c) reduce the amount of money spent on a meal.

#### *Law – penalties for leaving excess food*

The CAFWL incorporates legal measures to deter food waste by imposing penalties (i.e. laws) on restaurants that promote over-consumption and on consumers who leave excess food on their plates (Article 7 and Article 28; [Lau, 2023](#)). This approach aligns with the law component of [Rothschild's \(1999\)](#) social marketing framework, which uses penalties as well as the threat of penalties as a method to encourage behaviour change. By associating food waste with a potential financial consequence, this policy seeks to reduce excessive food orders and encourage responsible consumption. Similar penalties in buffet-style restaurants worldwide have shown effectiveness in reducing food waste ([Ang et al., 2021](#); [Stöckli et al., 2018](#)), as consumers face an economic disincentive for taking more food than they can consume. However, research suggests that such penalties may sometimes crowd out intrinsic motivation by framing waste reduction as an externally imposed requirement rather than a voluntary choice. [Gneezy and Rustichini \(2000\)](#) cautioned that consumers might interpret fines simply as part of the overall cost, reducing their intrinsic motivation to order less. Similarly, [Wang and Hao \(2020\)](#) suggested that viewing fines as a “price” could undermine participation and diminish the desired behaviour change.

Despite these concerns, studies by [Kuo and Shih \(2016\)](#) and [Chang \(2022\)](#) support the hypothesis that food waste penalties can effectively reduce food waste and food waste opportunities by nudging consumers towards more mindful ordering behaviour. We further propose that Rothschild's framework supports this approach. Penalties and potential penalties directly impact motivation by increasing the cost of food waste, thereby discouraging over-ordering. When consumers are aware they may face a fine for leaving food uneaten, they are more likely to order only what they intend to consume, which aligns with CAFWL's goal of reducing waste. In addition, reminding people of potential penalties provide an opportunity for consumers to reflect on their consumption habits in the context of economic consequences, reinforcing the intention to reduce food waste. Based on this reasoning, we hypothesise:

*H3a-c.* Imposing penalties for leaving excess food will reduce the (a) number of distinct dishes ordered; (b) number of net dishes ordered; and (c) amount of money spent on a meal.

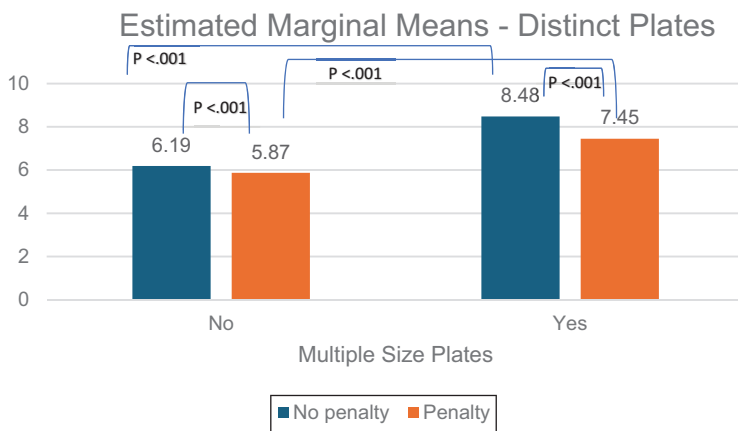
#### *Interaction effects of social marketing interventions on ordering and food waste*

The interplay between different food waste interventions – education, marketing and law – can amplify their overall effectiveness, as each targets different aspects of consumer behaviour. Various studies suggest that these interventions, when combined, may produce stronger outcomes than when implemented independently. For instance, [Matzembacher et al. \(2020\)](#) argued that the type of restaurant and the level of consumer autonomy (i.e. ability to act) significantly impact food waste, particularly in settings where consumer decision-making plays a central role. Similarly, [Hamerman et al. \(2018\)](#) found that consumers' likelihood to take leftovers home depends on both the social setting and whether a server prompts this behaviour, illustrating how motivation can be enhanced by external cues, such as social norms which have been found to increase the willingness need to reduce food waste intentions ([Zheng et al., 2023](#)). [Chang \(2022\)](#) further showed that interactions between serving styles (e.g. self-service buffet vs rolling trolley service) and inducements (e.g.

discounts, penalties or moral appeals) affect food waste volumes, highlighting the potential for combined strategies to influence consumer behaviour across diverse contexts.

However, despite such findings, there is limited research examining the interaction of [Rothschild's \(1999\)](#) three social marketing strategies – education, marketing and law – in a combined approach to food waste reduction. Using the MOA framework (Motivation, Opportunity and Ability), we suggest that these interventions not only reinforce one another but also address distinct consumer needs and decision-making processes that, together, encourage mindful ordering and reduce food waste (see [Figure 1](#)):

- *Education and marketing (Clean Your Plate Campaign + portion choices)*: Combining educational messaging (Clean Your Plate) with portion size options provides both motivation and opportunity for consumers to order mindfully. Education raises awareness and motivates consumers by appealing to their sense of social responsibility, whereas portion choices provide an accessible, concrete way to act on this motivation, empowering them with the ability to make waste-conscious decisions. Together, these interventions create an environment where consumers are both encouraged and enabled to make more sustainable choices, resulting in reduced ordering and lower food waste potential.
- *Marketing and law (portion choices + penalties)*: The pairing of portion size choices with penalties for leaving excess food combines opportunity and motivation. While portion size options provide consumers with the opportunity to select smaller, more suitable quantities, penalties act as a deterrent for over-ordering, adding an economic consequence for wasteful behaviour. This combination encourages consumers to order only what they need, as they are both presented with waste-reducing choices and discouraged from wasteful behaviour through penalties. Together, these strategies reinforce the intent to minimise food waste by balancing choice with accountability.
- *Education and law (Clean Your Plate campaign + penalties)*: The integration of educational messages and penalties merges motivation with a formal consequence, addressing both the intrinsic and extrinsic factors influencing consumer behaviour. Educational messages can inspire intrinsic motivation to avoid waste by appealing to personal values, whereas penalties introduce an extrinsic motivator that reinforces the



**Figure 1.** Means of distinct plates ordered  
Source: Authors' own creation

desired behaviour. This combination supports behaviour change by aligning internal values with external consequences, encouraging consumers to take responsibility for their consumption habits.

- *Education, marketing and law (Clean Your Plate campaign + portion choices + penalties)*: The simultaneous application of all three interventions provides a comprehensive strategy that leverages the full framework across MOA settings: motivation through education, opportunity through portion choices, and ability reinforced by penalties. This combination addresses multiple dimensions of consumer behaviour, creating a supportive environment for waste-conscious decision-making while dissuading over-consumption. By integrating these three approaches, this comprehensive strategy has the potential to maximise the reduction in food ordering, aligning closely with the CAFWL's overarching goal of food waste minimisation.

Based on this reasoning, we hypothesise that:

- H4a.* Providing consumers with the Clean Your Plate campaign and portion choices will reduce the (a) number of distinct dishes ordered; (b) number of net dishes ordered; and (c) amount of money spent on a meal.
- H4b.* Providing consumers with portion size choices and imposing penalties for leaving excess food will reduce the a) number of distinct dishes ordered; b) number of net dishes ordered; and c) amount of money spent on a meal.
- H4c.* Providing consumers with the Clean Your Plate campaign and imposing penalties for leaving excess food will reduce the a) number of distinct dishes ordered; b) number of net dishes ordered; and c) amount of money spent on a meal.
- H4d.* Providing consumers with the Clean Your Plate campaign and portion size choices, and imposing penalties for leaving excess food will reduce the (a) number of distinct dishes ordered; (b) number of net dishes ordered; and (c) amount of money spent on a meal.

### Study overview

We used a  $2 \times 2 \times 2$  full factorial experimental design to assess the direct and interaction effects of all three social marketing intervention elements – (with clean your plate message, without)  $\times$  (one size, two sizes)  $\times$  (with punishment, without punishment). A random sample of consumers in China was recruited via Question Star to participate in this study. Participants are randomly assigned to one of eight alternative hypothetical restaurant menus (see Appendix for sample of selected manipulations). The hypothetical scenarios were adopted from previous research that use them effectively to provide insights into consumer behaviours and intentions (e.g. Loureiro *et al.*, 2023), asking respondents to consider how much food they would order for dinner, for a couple plus a 15-year-old child [2].

### Method

#### *Respondents and design*

This study surveyed 1,629 respondents in April 2023, with 201–207 responses allocated to each of the eight scenarios. This sample size is deemed sufficient to identify statistically significant differences between scenarios. Table 3 below provides demographics details of the sample. Four respondents with inaccurate dates of birth were removed, as well as 16

**Table 3.** Respondent demographics

Variable	Categories	%
Age (years) 31.29 (6.89)	18–24	13.7
	25–40	72.7
	41–55	7.7
	56+	0.8
Gender	Male	49.5
	Female	50.5
Family size (number of family members) 3.50 (0.863)	1	0.7
	2	4.4
	3	56.7
	4	21.6
	5	15.8
	6+	0.7
Approximate monthly income of family 15,000–19,999 yuan	Less than 5,000 yuan	3.1
	5,000–7,999 yuan	8.3
	8,000–9,999 yuan	10.6
	10,000–14,999 yuan	20.6
	15,000–19,999 yuan	19.8
	20,000–24,999 yuan	14.6
	25,000–29,999 yuan	9.0
	30,000–34,999 yuan	5.7
	35,000–39,999 yuan	2.8
	40,000–44,999 yuan	2.0
	45,000–49,999 yuan	0.8
50,000 yuan and above	2.9	
Number of distinct dishes ordered 7.0 (2.67)	1–5	30.1
	6–10	60.4
	11–15	8.8
	16–20	0.6
	21+	0.1
Number of net dishes ordered (1.0 large, 0.5 small) 5.89 (2.11)	0.5–5	43.6
	6–10	53.1
	11–15	3.1
Total amount spent on the meal in yuan 354.917 (127.31)	30–180 yuan	9.3
	210–360 yuan	56.5
	390–540 yuan	27.6
	570–720 yuan	5.7
	720 yuan +	0.6
Percentage of small dishes overall (758 respondents that could order small dishes) 57.45 (23.81)	0.08–20	7.9
	20.1–40	19.7
	40.1–60	26.6
	60.1–80	28.2
	80.1–100	17.7

**Note(s):** The numbers reported under each variable is their overall mean and standard deviation

**Source(s):** Authors' own creation

respondents that ordered four or more net meals (12+ meals) per person as outliers. This results in final data set of 1,609 usable respondents.

As shown in [Table 3](#), the average age of respondent was 31.29 years (SD = 6.886), with 73% of respondents in the 25–40 years category. Female respondents make up 50.05% of the sample. The average family size of 3.50 (SD = 0.863), and 56.7% in a three-person family. The average family income was within the 15,000–19,999 yuan range, which represents the largest category at 20.6%.

### *Procedure and measures*

This study used a  $2 \times 2 \times 2$  between-subject design and controlled for respondents' gender, income and family size – (with clean your plate message, without)  $\times$  (one size, two sizes)  $\times$  (with punishment, without punishment). Respondents were presented with a hypothetical restaurant menu (see Appendix) and prompted with the following hypothetical scenario description: “Suppose you and your family (a couple plus a 15-year-old child) go to a Chiuchow restaurant, and you are responsible for ordering the food. Please choose the dishes you would like to order from the menu”. This was designed to place everyone in the same food ordering context. The menu featured 30 food items, including 11 Chiuchow specialties, 3 soups, 4 soya Chiuchow dishes, 2 casseroles, 6 noodles and congee and 4 desserts, with realistic restaurant prices ranging from 15 to 114 yuan.

Half of the scenarios provided both small and large portion items (i.e. 60 items). Small portions cost 50% of the cost of the larger items. The “Clean Your Plate” campaign slogan that has been used in China since 2013 ([Wang et al., 2022](#)) appeared at the top of the menu in half of the materials. In addition, the menu included the CAFWL recommended penalties for food waste in half of the scenarios, stating: “leftovers over 50 grams may be charged” with no explicit value specified.

While previous studies have used various dependent measures of food waste, such as intentions to leave uneaten food ([Setiawan and Puspitasari, 2023](#)), this study adopts food ordering behaviour as a practical indicator of potential food waste. That is, lower ordering is assumed to reflect a reduction in potential food waste, following previous research ([Trivedi et al., 2023](#)).

This study measured the impact of the social marketing interventions on reducing ordering levels using three ways. First, it examined the cost of the overall meal – with a mean of 354.91 yuan (SD = 127.31 yuan). It was assumed that if the interventions are effective, individuals would spend less money. Second, the analysis assessed the number of distinct meals ordered – with a mean of 7.0 (SD = 2.67). While this measure may indicate smaller net orders across the alternative menu offerings conditions, there may be scenarios where individuals may order more smaller-sized dishes. This behaviour aligns with a form of variety seeking ([Kahn, 1995](#), p. 139), where “individuals seek diversity in their choices of services or goods”. A primary reason for such behaviour is that having more dishes available in both small and large sizes is perceived as increasing choice ([Bernstein et al., 2008](#)). When available, the percentage of smaller dishes in the meal reflected 57.45% of purchases (SD = 23.8). Thus, when smaller dishes were offered, more than half of all purchases were for smaller dishes, which supports the variety-seeking supposition. Third, this study assessed the net number of dishes ordered. This is different from the number of distinct dishes, as net number of meals is designed to calculate the overall volume of food. Small dishes were counted as 0.5 and regular dishes were counted as 1.0, with a mean of 5.89 dishes (SD = 2.1). It was anticipated that if the interventions were effective, this would reduce the overall food volume, although variety-seeking behaviour could still lead to an increase in the total number of dishes ordered.

**Results**

The study used a MANCOVA analysis to evaluate the efficacy of three interventions – “Clean Your Plate” as an educational element, multiple portion size option as a marketing element and penalties as legal element – on three dependent measures: the total number of dishes ordered, the net number of dishes ordered [3] and the total meal cost. The results are presented in Tables 4 and 5. As shown in the tables, the main effects of the interventions were significant, except for multiple size option on total meal cost (see Table 4 for MANCOVA results and Table 5 for mean test results).

As shown in the tables, the main effects of interventions were significant (*t*-tests in Table 5 provide direction of effects). Participants exposed to the “Clean Your Plate” campaign ordered fewer total dishes ( $M_{\text{edu}} = 6.80$  vs  $M_{\text{ctrl}} = 7.20$ ,  $t = 3.02$ ,  $p < 0.001$ ), the net number of dishes ordered significantly decreased ( $M_{\text{edu}} = 5.69$  vs  $M_{\text{ctrl}} = 6.09$ ,  $t = 3.81$ ,  $p < 0.001$ ). In addition, total meal cost significantly dropped in condition with “Clean Your Plate” campaign, compared to control condition ( $M_{\text{edu}} = 269.80$  (yuan) vs  $M_{\text{ctrl}} = 319.93$ ,  $t = 3.74$ ,  $p < 0.001$ ). These findings support hypothesis *H1a-c*, indicating that the campaign effectively reduces unnecessary ordering and spending, thus reducing the potential for food waste.

The availability of multiple portion sizes increased the total number of dishes ordered, compared to the control condition with only large portions ( $M_{\text{mktg}} = 7.97$  vs  $M_{\text{ctrl}} = 6.03$ ,  $t = 15.66$ ,  $p < 0.001$ ). In addition, it reduced the net number of dishes ordered ( $M_{\text{mktg}} = 5.75$  vs  $M_{\text{ctrl}} = 6.03$ ,  $t = 2.70$ ,  $p < 0.001$ ). However, multiple portion size availability has no significant effect on total meal cost ( $M_{\text{mktg}} = 304.54$  vs  $M_{\text{ctrl}} = 312.27$ ,  $t = 1.24$ ,  $p > 0.001$ ,  $F = 1.49$  in Table 4). These results partially support *H2a-c*, showing that offering smaller portions encourages variety-seeking behaviour as consumers opt for a greater number of smaller dishes and also consumer will end up spending similar amount as when larger order sizes were available. However, availability of variety of portion sizes still reduces the volume of the orders. This represents a positive step towards reducing food waste.

**Table 4.** MANCOVA results

Hypotheses	Variables	Total dishes ordered		Net dishes ordered (large 1/small 0.5)		Total yuan spent	
		<i>F</i>	Partial eta squared	<i>F</i>	Partial eta squared	<i>F</i>	Partial eta squared
	Corrected model	28.26***	0.161	7.08***	0.046	5.55***	0.036
	Intercept	350.82***	0.178	341.63***	0.174	280.83***	0.148
	Age	0.42	0.000	0.68	0.000	0.12	0.000
	Gender	0.71	0.000	0.00	0.000	0.30	0.000
	Family size	3.05	0.001	3.95*	0.002	1.16	0.002
	Household income	1.731	0.001	6.38**	0.004	8.41**	0.005
<i>H1</i>	Clean Your Plate	11.54***	0.007	15.52***	0.010	14.58***	0.009
<i>H2</i>	Multiple sizes	252.50***	0.135	7.33**	0.005	1.49	0.001
<i>H3</i>	Penalty	30.71***	0.019	33.76**	0.020	24.57***	0.015
<i>H4a</i>	Clean Your Plate* Multiple * sizes	0.12	0.000	0.10	0.000	0.28	0.000
<i>H4c</i>	Clean Your Plate* Penalties *	0.22	0.000	0.48	0.000	0.20	0.000
<i>H4b</i>	Multiple sizes* Penalties	8.48**	0.004	7.24**	0.005	8.36***	0.004
<i>H4d</i>	Clean Your Plate* Multiple * sizes* Penalties	0.90	0.001	4.24	0.001	0.30	0.000

**Note(s):** \*\*\*<0.001; \*\*<0.01; \*<0.05

**Source(s):** Authors’ own creation

**Table 5.** Mean main effects

Intervention	Total dish ordered	Dependent variable	
		Net dishes ordered (large 1/small 0.5)	Total meal cost (In yuan)
Clean Your Plate	6.80 (2.56)**	5.69 (2.02)**	296.80 (122.40)**
Multiple size option	7.97 (2.93)**	5.75 (2.25)*	304.54 (133.05)
Penalties	6.66 (2.40)**	5.59 (2.01)**	293.17 (118.51)**
No intervention <sup>a</sup>	6.27 (1.953)	6.27 (1.95)	324.85 (114.53)

**Note(s):** Mean comparison to the no intervention state \*\* significant at  $>0.001$ ; \* significant at  $>0.01$ ; <sup>a</sup>Total dishes and net dishes are identical under the no intervention condition. The numbers reported are means and standard deviations

**Source(s):** Authors' own creation

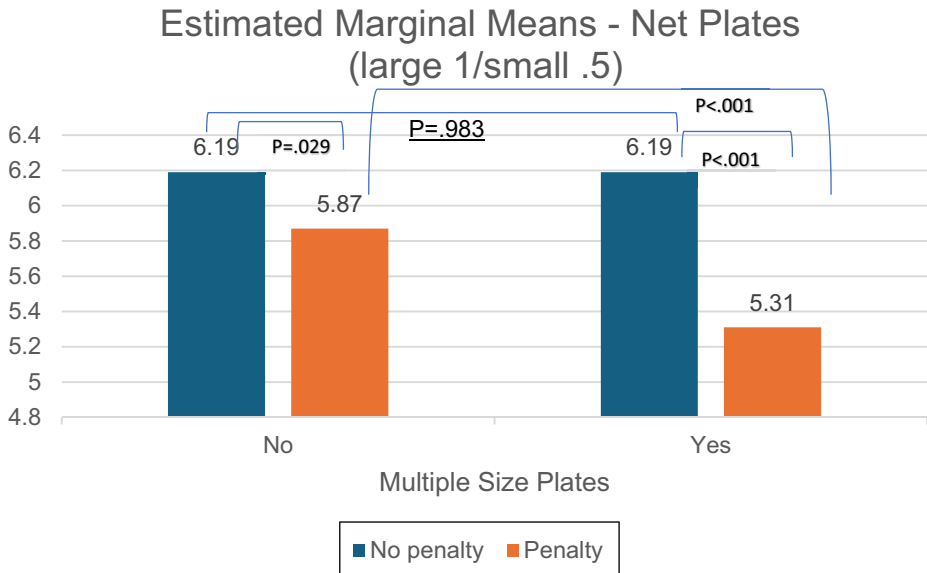
Penalties for leaving excess food significantly reduced the total dishes ordered ( $M_{law} = 6.66$  vs  $M_{ctrl} = 7.34$ ,  $t = 5.27$ ,  $p < 0.001$ ) as well as the net number of dishes ordered compared to control condition with no penalties ( $M_{law} = 5.59$  vs  $M_{ctrl} = 6.19$ ,  $t = 5.76$ ,  $p < 0.001$ ). In addition, total meal cost was lower under penalty condition ( $M_{law} = 293.17$  vs  $M_{ctrl} = 323.72$ ,  $t = 4.95$ ,  $p < 0.001$ ). These results support *H3a-c*, demonstrating that penalties discourage over-ordering and over-spending.

Interaction effects among the interventions were also examined to assess the combined influence of education, marketing and penalties on ordering behaviour. The three-way interaction among all the interventions was not significant across any measures. This suggests that the combined application of all interventions does not create a synergistic effect, thus failing to support *H4d*. The interaction between “Clean Your Plate” campaign and multiple portion size was not significant across any measures, failing to support *H4a*. This indicates that the combined effect of education and portion size interventions does not enhance the reductions in food ordering and food waste beyond their individual impacts. Similarly, the interaction between “Clean Your Plate” and penalties showed no significant effects, failing to support *H4c*.

However, the interaction between multiple portion size and penalties was significant across all measures, supporting *H4b*. To further explore the significant interaction between multiple portion size options and penalties, we examined their combined effects in greater details across all the measures.

As shown in [Figure 1](#), offering multiple size options significantly increased the number of distinct dishes ordered as compared to only offering large dishes; supporting the proposition that smaller portion sizes encourage variety-seeking behaviour. For example, consumers could have six small dishes or three large dishes for the same price and receive the same food volume. The results show that having multiple size dishes available increased the number of distinct dishes ordered (i.e. from 6.19 to 8.48). However, this increase was moderated by the presence of penalties for leaving excess food, which led to reduction in the number of distinct dishes ordered (from 5.87 to 7.45).

When multiple sized dishes were accompanied by a penalty, the average net number of dishes ordered fell by 0.7 dishes, as shown in [Figure 2](#). This indicates that penalties and offering smaller sizes work synergistically to reduce the overall volume of food ordered, further lowering the potential for food waste. [Figures 1](#) and [2](#) collectively illustrate that penalties enhance the effectiveness of multiple portion size options by reducing both the total and net number of dishes ordered.

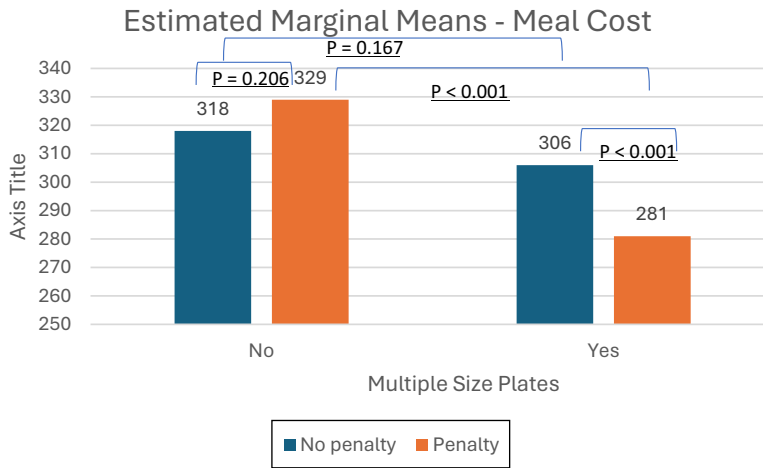


**Figure 2.** Means of net plates ordered  
Source: Authors' own creation

Finally, we examined the interaction between multiple portion size and the amount spent on the overall meal. As depicted in [Figure 3](#), the results indicate that the amount spent on a meal reduces when penalties were combined with multiple food size options. For example, when no penalty was applied, offering multiple portion sizes slightly reduced spending ( $M = 306$  yuan) compared to large portions ( $M = 318$  yuan). However, when penalties were introduced, spending decreased significantly from  $M = 329$  yuan in the large portion condition to  $M = 281$  yuan in the multiple portion size available condition. These findings suggest that penalties amplify the economic disincentive for over-ordering, particularly when combined with smaller portion size options.

### Implications and discussion

This study demonstrates that the three social marketing interventions proposed in the Chinese AWFL – education, marketing and law – are individually effective in reducing potential food waste through encouraging more responsible ordering behaviour. In the literature, the combined influence of these intervention tools has been less explored, especially in the context of the CAFWL. It was anticipated in this study that all two-way and three-way interactions would be significant. Yet the only meaningful two-way interactions were between penalties and when consumers were given options to order small or large dish sizes. Specifically, in the light of potential penalties for leaving leftovers, the ability to order a mix of smaller and larger size dishes reduces the net volume of food ordered, therefore reducing the potential for food waste. This approach not only addresses environmental concerns but also aligns with consumer preferences for variety in meals. Such benefits are important, as researchers have found that variety seeking increases consumer satisfaction ([Huy Tuu and Ottar Olsen, 2013](#)). As such, the combination of penalties and portion sizes may create



**Figure 3.** Mean total meal cost  
**Source:** Authors' own creation

win-win-win opportunities for policymakers, consumers and the natural environment. Although this may reduce restaurant profits, as smaller meals have lower margins.

Communication is one of the primary tools commonly used in reducing food waste, such as educating consumers about order sizes, the environmental consequences of wasting food and encouraging responsible ordering behaviour. However, the lack of significant interaction effects between educational campaigns and the other two interventions (penalties and portion sizes) points to a potential plateau in the effectiveness of messaging-based strategies. The Clean Your Plate campaign has existed in China for 10+ years. Thus, this may lead to message saturation, reducing its perceived novelty and impact. While there being some significant interest in the program when the CAFWL was implemented in 2021 (Wang *et al.*, 2022), our findings highlight the need for more innovative or refreshed communication strategies to sustain consumer engagement.

#### *Implications for practice*

While the Clean Your Plate interventions should be relatively easy to implement outside China, some other food waste interventions are more complicated. For example, policing food waste would require that restaurants have additional processes and resources, as well as may create consumer animosity (particularly where there are penalties). Although the CAFWL does not direct restaurants to pass on any fines to the government, so keeping these funds may offset any process implementation costs. Furthermore, while the provision of smaller meal options has universal support in the literature (e.g. Riis, 2014), this could create cost issues for restaurants. For example, the incremental costs of producing larger portions are lower (and thus profits are higher) than producing smaller portions. This study did not vary the per gram prices of the smaller dishes. Exploring situations where smaller portions were, say, 40% less expensive (rather than 50%) could help determine whether there is some optimal pricing point for these smaller dishes; thereby increasing restaurant revenue while still reducing waste.

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*Implications for theory and policy*

There are a wide range of interventions that have been used in various studies to examine food waste. Understanding whether interventions interact is important for identifying the optimal policy settings. When such interactions arise, there could be additive (or reduced) effects that can lead to additional benefits (or unanticipated disadvantages). Thus, future research should examine how various intervention components operate in combination (Stöckli *et al.*, 2018), especially in the context of the CAFWL that contains multiple independent components.

There also needs to be further research on whether interventions to reduce food waste have been effectively implemented by restaurants in China, as it appears that some have failed to understand their obligations and have already breached the law (Lau, 2023). Future field studies could evaluate such interventions to assess their effectiveness in reducing food waste. Although assessing whether policy interventions such as fining consumers for excess food waste are being applied will be more difficult to evaluate. There is also the potential consumer backlash to such fines that needs to be considered, particularly if they believe the restaurant is keeping the money as a way of boosting revenue. Further research should therefore be undertaken to assess how consumers interpret the use of penalties and whether corresponding messages such as “a penalty for excess food will be charged to defer disposal costs” are effective at minimising consumer backlash.

*Implications for society*

The societal implications of this research are profound, given the critical need to address food waste globally. By reducing unnecessary food orders, the interventions contribute to mitigating environmental degradation caused by food waste, including reductions in greenhouse gas emissions, water usage and land exploitation. If managed effectively, the reduction in food wasted could create “additional food,” that could be used to assist those in facing food insecurity.

From an ethical perspective, these interventions also help address food insecurity by encouraging more responsible consumption patterns. Restaurants and policymakers can use this research to foster a cultural shift towards mindful dining behaviours, enabling consumers to make sustainable choices without sacrificing satisfaction. For instance, the integration of penalties and portion size options can reduce waste while catering to consumers’ desire for variety.

While penalties for excess food waste may seem punitive, they also offer an opportunity for public education. Messaging that frames these fines as contributing to disposal costs or environmental initiatives can enhance public understanding and acceptance. By demonstrating that these interventions serve a greater societal good, businesses and governments can encourage a collective effort to reduce food waste.

**Conclusion**

This research found that the three social marketing interventions of the CAFWL are separately effective in reducing the amount of food ordered, whether total dishes or net dishes. These also saves consumers money, except in the case of offering multiple sized dishes. The interaction between penalties and various dish sizes suggests this combination provides additional food waste savings, by allowing consumers to order small dishes in combination with large dishes reducing the total amount of food ordered. These results indicate that governmental mandates could be beneficial in reducing food waste and may address any restaurant management concerns associated with alternative interventions (Gruber *et al.*, 2016). It is unclear whether other countries have the political ability or will, to implement such food waste interventions.

That is, China's stronger regulatory environment may create unique opportunities to deal with consumer food waste in restaurants.

There are many opportunities to undertake further research. For example, while this study focused on the CAFWL, there are other interventions that could be assessed such as reminders by serving staff. This study was also conducted online, and while online food ordering has become a normal activity (Gunden *et al.*, 2020), such ordering behaviour should be further assessed in terms of food waste. For example, building on the work of (Ong *et al.*, 2023) which looked at how online messaging impacts actual behaviour. Such a study could include an examination of the volumes and types of ordered as well as food wasted. Understanding, whether people undertaking over-ordering are doing this on purpose to a future meal (i.e. deliberating obtaining leftovers), although research suggests much of the food taken home as leftovers is wasted (Talwar *et al.*, 2021). Another future study option is to evaluate post-consumption satisfaction, to examine whether food waste interventions such as offering small and large dish options increases satisfaction (Sharma *et al.*, 2021). Furthermore, the CAFWL offers an opportunity to explore whether consumer awareness of these regulations impacts on their behaviours.

Future research could examine various consumer characteristics, such as variety seeking, frugality and environmental orientation, in terms of their impact on ordering behaviour and associated food waste. Other contextual factors, such as dining out with others is important in China, as having excess food and thus over-ordering may be seen as being good hosts, or people may want to appear wealthy through conspicuous consumption by over-ordering (Wang, Rasoolimanesh, Kunasekaran and Zhao, 2024). There may be consumer factors such as individuals body mass index or how hungry they are when ordering, that also might impact results and could be explored in the future. Finally, similar research could be undertaken in other countries, although the lack of specific CAFWLs in restaurants could substantially change the context.

## Notes

1. Within social marketing, there is generally a focus on voluntary behavioural change. However, the promotion and enforcement of laws associated with inappropriate behaviours is often used within social marketing settings. Such as promoting the legal requirements and penalties, for example, drink driving (Snitow *et al.*, 2011) or smoking bans (Skerletopoulos *et al.*, 2020).
2. This research has received ethical approval through both Deakin University and Shenzhen University (where Dr Li was employed at the time of the data collection).
3. Net number of meals calculates the overall volume of food, where small dishes were counted as 0.5 and regular dishes were counted as 1.0.

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Appendix. Sample of menus provided

Information X Multiple Portion Size X No Penalty

Suppose you and your family (couple plus a 15-year-old child) go to a Chiuchow restaurant, you are responsible for ordering the food, please choose the dishes you would like to order from the menu. (Chinese version was supplied to participants)

Chiuchow Specialties

Options	Price
Sweet and Sour Pork (Double Serving)	¥ 59
Sweet and Sour Pork (Single Serving)	¥ 29.5
Braised Pork with Preserved Mustard Greens (Double Serving)	¥ 59
Braised Pork with Preserved Mustard Greens (Single Serving)	¥ 29.5

MORE FOOD OPTIONS WERE INCLUDED



No Information X Single Portion Size X No Penalty

Suppose you and your family (couple plus a 15-year-old child) go to a Chiuchow restaurant, you are responsible for ordering the food, please choose the dishes you would like to order from the menu. (Chinese version was supplied to participants)

Chiuchow Specialties

Options	Price
Sweet and Sour Pork (Double Serving)	¥ 59
Braised Pork with Preserved Mustard Greens (Double Serving)	¥ 59

MORE FOOD OPTIONS WERE INCLUDE

Figure A1. Sample of menus provided  
Source: Authors' own work

### No Information X Single Portion Size X Penalty

Suppose you and your family (couple plus a 15-year-old child) go to a Chiuchow restaurant, you are responsible for ordering the food, please choose the dishes you would like to order from the menu. (Chinese version was supplied to participants)

**Leftovers over 50 grams may be charged an additional 60 yuan meal fee**

*Chiuchow Specialties*

Options	Price
Sweet and Sour Pork	¥ 59
Braised Pork with Preserved Mustard Greens	¥ 59

MORE FOOD OPTIONS WERE INCLUDED

### Information X Multiple Portion Size X Penalty

Suppose you and your family (couple plus a 15-year-old child) go to a Chiuchow restaurant, you are responsible for ordering the food, please choose the dishes you would like to order from the menu. (Chinese version was supplied to participants)

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Braised Pork with Preserved Mustard Greens (Single Serving)	¥ 29.5

MORE FOOD OPTIONS WERE INCLUDED



**Figure A1.** Continued

### **About the authors**

Michael Polonsky is an Alfred Deakin Professor and Head of the Department of Marketing at Deakin University. His work focuses on a range of social and environmental issues across business and marketing domains. He seeks to understand corporate, consumer and governmental actions and how they interact to create individual, societal and environmental well-being. He is a Fellow of The Australian and New Zealand Academy of Marketing. Michael Polonsky is the corresponding author and can be contacted at: [michael.polonsky@deakin.edu.au](mailto:michael.polonsky@deakin.edu.au)

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Chris Dubelaar is a Professor of Marketing at Deakin University in Melbourne, Australia. He studies behavioural eating using both meta-analytic and experimental approaches. His research focuses on issues around helping people make better food choices through how they serve, experience and consume food both alone and with other people.

King King Li is an Experimental Economist. He is currently an Associate Professor in the Department of Economics and Finance at The Hang Seng University of Hong Kong. His research interests are in Experimental Economics, Behavioural Economics and Behavioural Finance. He is the first to use Experimental Economics to study the effect of language on decision-making (JEconPsy), memory recall biases (ExpEcon) and preference for randomisation (JRU).