



# Understanding the retirement-consumption puzzle through the lens of food consumption-fuzzy regression-discontinuity evidence from urban China



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## ABSTRACT

This paper provides an understanding of the widely-documented retirement-consumption puzzle from the perspective of food consumption. Exploiting the mandatory retirement age cut-off for public-sector male employees in urban China to obtain a source of exogenous variation in their retirement status, this paper identifies the causal impacts of retirement on four major aspects of their food consumption: food expenditure, time spent in food acquisition, the quantity and quality of food consumed. Based on data from the China Health and Nutrition Survey, our fuzzy regression-discontinuity analysis finds that, consistent with the retirement-consumption puzzle, retirement reduces elderly males' total food expenditure by 49–55%. However, retirement barely changes the quantity of food they consume (measured by total calorie intakes). Further analysis suggests that elderly males substitute time for money in food acquisition upon retirement, which helps to reconcile the differential impacts of retirement on food expenditure and food consumption. Finally, retirement greatly changes elderly males' diet structure. They consume significantly less food with animal origins (and thus less fat and protein) and more grains (and thus more carbohydrate) upon retirement, which undermines their diet balance by the standards provided by the Chinese Nutrition Association.

## 1. Introduction

Both Modigliani and Brumberg's (1954) life-cycle saving model and Friedman's (1957) permanent-income hypothesis predict that rational, forward-looking individuals can smooth their consumption in response to foreseeable income shocks such as retirement. Yet many empirical studies have found in various Western countries that households' expenditure on nondurable goods declines significantly upon the retirement of their members (e.g. Battistini et al., 2009; Cho, 2012; Hamermesh, 1984; Schwerdt, 2005; Wakabayashi, 2008). The drop in nondurable expenditure, often termed the “retirement-consumption” puzzle, has been conventionally interpreted as evidence of one's failure to plan sufficiently for his/her retirement (e.g. Bernheim et al., 2001) or of unanticipated shocks that occur at retirement (e.g. Banks et al., 1998).

However, the seminal study by Aguiar and Hurst (2005), among others, cast serious doubt on the plausibility of these interpretations, at least when it comes to food consumption. Based on Becker's (1965) theory of time allocation, which interprets consumption as the production of utility using both time and purchased goods as inputs, Aguiar and Hurst argued that the drop in one's food expenditure at retirement

does not necessarily imply a drop in the actual amount of food he/she consumes. This is because rational individuals can substitute their increased time for reduced money in food acquisition during retirement. Using two nationally representative datasets from the United States, Aguiar and Hurst provided strong evidence to support this argument. First, they showed that elderly American individuals' food consumption, measured by total calorie intakes, barely changes at retirement. Second, in accompany with the (17%) drop in food expenditure at retirement, American retirees' time spent in domestic food production increases by more than 50%. Thus, viewed from the angle of resource substitution in home production, the widely-documented retirement-consumption puzzle is hardly puzzling.

Aguiar and Hurst's study has two implications that are relevant for policy analysis pertaining to the welfare of the elderly, whose budget share for food is usually large. First, using food expenditure to directly proxy food consumption in welfare analysis may result in misleading assessments of retirees' well-beings in aging societies such as the U.S. On the one hand, food expenditure tends to underestimate retirees' actual food consumption in absolute terms. On the other hand, relative measures such as the Engle coefficient may overstate retirees' well-beings, because the drop in food expenditure at retirement may lead to

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an overestimation of their budget shares for more-luxurious, non-food goods. Given the “problem” of population aging of how “to provide income and health security at older ages and to do so at affordable budgets” (National Research Council, 2012, p.17), an accurate understanding of how food expenditure relates to actual food consumption among retirees may help provide useful information for designing policies to tackle this problem. If, for example, the drop in food expenditure at retirement indeed predicts a significant drop in actual food consumption, then reforming existing pension and healthcare programs to provide more income and protection to retirees, as is currently undergoing in China (Ministry of Human Resources and Social Security of China, 2017), may be desirable.

Second, retirement induces a series of changes in the elderly’s daily activities and resource endowments. Not only does the termination of work commitment reduce their demand for dining out, but it also leads to changes in the relative abundance of their time and monetary resources, which in turn urges them to reoptimize their food choices. However, in reaction to these retirement-induced changes, whether they are able to fully smooth the *quantity* and *quality* of food consumption, two key determinants of their utility, is theoretically ambiguous and deserves careful empirical scrutiny. After all, whether a drop in food expenditure at retirement will change one’s well-being hinges on what else is being smoothed.

These implications naturally raise a question: Does elderly individuals’ food consumption behavior found in the U.S., in particular, their resource substitution at retirement, share some common patterns with that in other large aging societies, such as China, Japan and Korea, where the retirement systems and cultural backgrounds differ greatly from the American ones? If so, the conventional practice of using food expenditure to assess consumer welfare is likely to yield misleading results for elderly residents in these societies as well. More-reliable results may come from analysis that examines their actual food consumption behavior.

To help provide an answer, this paper examines the case of urban China, one of the world’s largest aging societies. The economic and institutional settings of urban China render its elderly residents an interesting population to study. First, as a rapidly aging society, urban China needs to accommodate increasingly more retirees in the near future (Liu et al., 2015). To help tackle the aforementioned “problem” of population aging, China is currently reforming its urban pension and healthcare systems, aiming to provide more benefits and protections to its retirees (State Council, 2016a, 2016b; Ministry of Human Resources and Social Security of China, 2017). However, these reforms are still in their early stages, and what specific measures should be taken in future stages are still under discussion. Therefore, a thorough understanding of retirees’ food consumption behavior can certainly help provide guidance for policy makers in urban China to design specific policy instruments. Moreover, if retirement leads to significant changes in one’s diet structure, food supply entities in this society may also need to adjust their business strategy to meet the changing food demand. From these perspectives, an in-depth analysis of one’s food consumption behavior upon retirement will provide useful information to assist decision-making for both food suppliers and regulatory bodies in urban China.

Second, the mandatory retirement system in public sectors in urban China provides a unique opportunity for identifying the *causal* effects of retirement. More specifically, established in the 1950s, this system sets 60 as the official retirement age for male employees and 55 or 50 for female employees (Lei et al., 2010; Dong and Yang, 2017). The unique retirement age cut-off for *males* allows us to apply a fuzzy regression-discontinuity (RD) method (Hahn et al., 2001; Lee and Lemieux, 2010) to achieve identification.<sup>1</sup> In particular, controlling for a flexible

function of age, the fuzzy RD method is able to isolate the impact of retirement from that of aging.<sup>2</sup>

To our knowledge, direct examination of the retirement-consumption puzzle has been quite limited in China.<sup>3</sup> To date, only a handful of studies (Li et al., 2015; Zhang and Lu, 2014; Zou and Yu, 2015; Dong and Yang, 2017) have examined the impacts of retirement on households’ nondurable expenditure in China. A desirable feature shared by these studies is that they disaggregated total nondurable expenditure into work-related expenditure and non-work-related expenditure (including food expenditure at home). By doing so, these studies found that more than half of the reduction in household nondurable expenditure is due to reductions in work-related expenditure, including food expenditure away from home, which helps explain the retirement-consumption puzzle. However, without investigating the impacts of retirement on more-detailed aspects of food consumption, such as nutrition intakes and diet quality, it may be too hasty to conclude that food consumption is fully smoothed at retirement in urban China.<sup>4</sup> For example, it is possible that the elderly have to sacrifice some diet quality for quantity in order to smooth the latter at retirement. Yet none of the previous studies in China has examined this possibility. This paper fills this gap by linking together four key aspects of food consumption, namely, food expenditure, time spent in food acquisition, the quantity and quality of food consumption, in examining the impacts of retirement in urban China.

Focusing on a sample of urban males aged 50–70 drawn from the China Health and Nutrition Survey (CHNS), a household survey covering nine provinces in China, our fuzzy RD analysis yields three important findings. First, while retirement reduces elderly males’ (and their households’) daily total food expenditure by more than 40%, it hardly changes the quantity of food they consume (measured by total calorie intake), echoing the finding of Aguiar and Hurst (2005). Second, consistent with the resource-substitution interpretation, retirement increases elderly males’ and their wives’ time spent in domestic food production by 36–40%. Third, retirement induces elderly males to substitute necessity foods for more-luxurious ones. As a result, they consume significantly less protein (by 24–25%) and fat (by 15–20%) and significantly more carbohydrate (by 25–26%) at retirement, which undermines their diet balance somewhat (by the standard set by the Chinese Nutrition Association). The negative retirement impact on diet balance suggests that the substitution between time and money cannot fully smooth one’s diet *quality* at retirement, a finding that previous studies in China failed to discover. Given this finding, well-designed public policies are needed to prevent nutrition and health problems for retirees as population aging progresses further in urban China.

The rest of the paper proceeds as follows. The next section develops an analytical framework for examining the impacts of retirement on elderly males’ food consumption behavior in urban China. Section 3 introduces the data, samples and key variables used in the analysis. Sections 4 and 5 present and discuss our empirical findings. Section 6 provides a number of policy implications derived from these findings. The final section draws conclusions and points out several directions for

(footnote continued)

First, there exist multiple retirement age cut-offs for urban females. Second, a non-trivial fraction of females does not comply with their retirement age cut-offs (Fig. 1). These problems render it very difficult to define the expected mandatory retirement age cut-off for a given female, a condition that is necessary for applying the fuzzy RD method.

<sup>2</sup> In contexts where no clearly-defined retirement age cut-offs are available, the common practice is to use age as an instrument variable for one’s retirement status. However, this method confounds the impact of age with that of retirement, since elder individuals are naturally more likely to be retired than younger ones.

<sup>3</sup> A number of recent studies published in Chinese scholarly journals examined the impact of uncertainty and income shocks on Chinese consumers’ consumption in contexts other than retirement, such as the introduction of the New Cooperative Medical Scheme in rural China (e.g. Ma et al., 2010; Bai et al., 2012).

<sup>4</sup> For example, Li et al. (2015) concluded that “Our findings can be explained by the life-cycle model with home production, suggesting that Chinese retirees smooth consumption well.”

<sup>1</sup> As with most previous studies (e.g. Lei et al., 2010; Li et al., 2015), we are unable to apply the fuzzy RD method to the female population in urban China, for two reasons.

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