Does Ethnicity Matter For Food Choices? An Empirical Analysis of Asian Immigrant Time Use

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ABSTRACT

As immigrants settle and extend their stay in the U.S., they may be exposed to a food culture and lifestyle that impacts their food choice decisions and health outcomes. This paper focuses on the behavioral changes and acculturation level of different generations of Asian immigrants on food choice decisions employing the 2013 American Time Use Survey. Heckman two-step regression results indicate that the 1st generation immigrants participate or spend more time on eating and drinking, food preparation, and grocery shopping; and less in travel-related eating and drinking compared with natives. The 1st generation is least likely to acculturate into American food culture. The 1.5 generation behaves more similarly to natives regarding the four food choice decisions and appears to acculturate over time. The 2nd generation shows no significant difference to natives. Immigrants acculturate by the food habit change from food at home to food away from home.

INDEX WORDS: Asian immigrants, acculturation, food choice decisions, American Time Use Survey

CHAPTER 1

INTRODUCTION

Immigrants from Asia is the second largest foreign-born group in the U.S. next to the population from Latin America. In 2012, there were 18.9 million U.S. residents who were Asian and was growing at 26% between the 2000 and 2010 censuses, which was more than any other major race group. Moreover, Chinese is the third most common language spoken at home in the U.S. behind English and Spanish (Ewert and Kominski 2014; Noss 2013).

Immigrants' stay in the U.S. may inevitably change their food choice decisions, ranging from grocery shopping, food preparation at home, and food away from home. For example, studies have found that the degree of change immigrants make in their diets increases with time in the U.S. and with various measures of acculturation (Akresh 2006). Particularly female migrants are negatively affected by migration and dietary acculturation due to their double marginalization both as being women and as being a migrant, which s can result in high fat and sugar diets, low consumption of fruits/vegetables, greater portions, consumption of convenience food and inactivity. (Popovic and Strasser 2013). 2nd generation immigrants have an especially high prevalence of being overweight (Bates et al. 2008) suggesting a prominent role of environmental and cultural factors rather than just genetics (Liu and Waldorf 2012). Changes in Asian immigrants' food choice decisions may have both short and long-term health consequences. Understanding these changes and examining their determinants is an important precursor to a fuller understanding of immigrants' acculturation to the American lifestyle and diet (Gordon-Larsen et al. 2003, Zaiceva and Zimmermann 2014).

Research on the changes in food choice decisions can also contribute to the level of acculturation of Asian immigrants into the American culture – a process through which migrants

and their children acquire the values, behavioral norms and attitudes of the host society. Considerations of time use by immigrants in food-related decisions can help to inform models of economic acculturation. Empirical economic research has examined the outcomes of the process of acculturation to focus on both prices (wage rates) and quantities (employment levels), as the indicators of immigrants' well-being, and provide signals to potential immigrants as well as emigrants (Hamermesh and Trejo 2013); which will in turn help push forward the acculturation process.

This research focuses on exploring the behavioral differences in food choice decisions between US-born non-Asian Americans (natives), the 1st generation, 1.5 generation, and 2nd generation Asian immigrants. With this broad realm, we have two objectives. First, we aim at identifying systematic differences in food consumption and preparation time use among the three groups. Second, we examine how the behaviors in food choice decisions change across generations of Asian immigrants. Such research is relevant to understanding how immigrants' acculturation into the American society impacts their health behaviors. It further helps identify opportunities for public policy and nutrition education targeting at-risk populations.

The remainder of this paper is organized as follows. Chapter 2 provides the motivation for this study. Chapter 3 presents the data with descriptive evidence. Chapter 4 presents the empirical strategy. Chapter 5 discusses the main empirical results. Chapter 6 concludes with implications.

CHAPTER 2

MOTIVATION

The theoretical literature on the immigrant's time use distinguishes non-market time allocation from the traditional paid-work time allocation, which can date back to Becker's series of research. Becker (1965) established the conceptual framework for studying time use by extending the standard labor supply model to account for multiple uses of time. Becker then extended his time allocation framework in 1981 by introducing the time allocation of a multi-person household that everyone is subject to a single preference function. In 1993, he further extended the human capital model that provides an analysis of time use with the investment of time in schooling, training, or other types of skills development competing with time spent working. Becker's framework has also extended in a number of recent research, including food production and consumption. Davis (2014) developed a unified household production model that focuses on the food at home production and consumption. He found that as the opportunity cost of time increases individuals substitute away from food at home towards food away from home. Senia et al. (2014) developed a similar household production model for time use in eating and food preparation among single adults. They concluded that food prices influence home production and time allocation decision, and low-income adults spend more time in food preparation and eating at home.

A multitude of recent empirical studies has investigated immigrant's time allocation and home production in households. Zaiceva and Zimmermann (2011) examine the multitasking behavior of immigrant households on home production, work and leisure activities using the 2000 UK Time Use Survey. They employ a simple Tobit model and confirm that ethnicity matters for multitasking activities. Based on their previous study, Zaiceva and Zimmermann (2014) then delve into the ethnic identity and traditional attitudes that are manifested by different time use behaviors

of ethnic minorities. They research the role that ethnicity and gender play in non-market time allocation decisions by various ethnicity groups and their integration level. The double-hurdle regression results indicate ethnic minority women engage in more "traditional" home activities, such as child care, food management, and religious activities. The recent study by Hammermesh and Trejo (2013) on immigrants' time use and acculturation process provides a framework to study immigrants' time use by examining specific time-use inputs into acculturation. This study shows sharp differences between the time use of immigrants and natives and develops a theory of the process of acculturation. Ribar (2013) systematically provides conceptual and methodological approaches to examining immigrants' time allocations in previous studies, as well as reviews data on time use both from primary and secondary data sources.

This study contributes to the literature by considering mainly food choice decision of Asian immigrants. Guided by Becker's conceptual framework of household production model, this paper utilizes the two-step Heckman selection model to examine systematic behavioral changes in various food choice decisions of different generations of Asian immigrants, which delves into the structural behavioral differences, speed of acculturation, as well as significant factors influencing the acculturation or trajectory.

Opportunity costs of non-market time, different preferences and tastes of ethnic minorities, integration experience, family composition, household productivity and other may result in different time allocation behaviors. Emigrating from Asia to the U.S. can have a substantial impact on a person's lifestyle and environment as such persons go through the process of acculturation (Miller et al. 2009). One area of particular interest is the resulting modifications in food choice decisions as Asian immigrants potentially adopt a more "Western" diet. This includes consuming more foods high in fat and low in fruits and vegetables over their more traditional and healthier

soy-based diet in Asia (Satia-Abouta 2003). Pan et al. (1999) suggest that Asian immigrants tend to select more American-style fast foods when they eat out. In addition, there is a tendency for women to decrease time dedicated to household production of food (food preparation and cleanup, grocery shopping, etc.) and increase time working, which is in correspondence with the changes in cultural values, often measured in relation to family and gender cultural attitudes or roles (Kim et al. 1999; Blackaby et al. 2002; Simpson et al. 2006). Importantly, these changes in patterns of food choice behaviors are usually associated with a substantial increase in energy and fat intake, a reduction in carbohydrates and a switch from whole grains and pulses to more refined sources of carbohydrates, resulting in a low intake of fiber (Yang and Read 1996; Holmboe-Ottesen and Wandel 2012; Lesser et al. 2014). This behavioral shift may also result in health consequences, leading to chronical diseases such as obesity, Type II diabetes mellitus, cardiovascular disease (CVD), hypertension, and cancers (Yang and Read 1996; Satia-About a 2003; Singh et al. 2009; Rosenmöller et al. 2011).

Ethnic minorities are likely to have different socio-cultural norms and preferences, gender-role attitudes, productivity as well as different costs (including the opportunity costs of time). From the perspective of cultural adjustment, the extent of dietary change is primarily related to the length of exposure to the new cultural environment (Freedman and Grivetti 1980; Ho et al. 1966; Yang and Fox 1979). It is considered to be to the first priority for immigrant's adaptation to the new country (Gordon 1964). In addition, younger immigrants are more likely to change their food habits (Ho et al. 1966; Cominsky 1977). Ergin and Kaufman-Scarborough (2010) has shown that immigrants maintain food customs of their culture-of-origin for a long period of time, which may create enclaves that can inhibit the acculturation process. Hrboticky and Krondl (1984) found that Chinese immigrants in Canada have different perceptions in flavor, health value, and prestige of

food than natives, leading to their varied food consumption patterns; however, the second generation immigrants have higher hedonic taste and prestige ratings to dessert, snack, and fast foods. Not surprisingly, this dietary change leads to the 2nd and 3rd generation immigrants greater risk-vulnerable weight gain and chronical diseases such as obesity, heart disease and hypertension (Liu and Waldorf 2012; Gray et al. 2005; Hrboticky and Krondl 1984).

Social factors, such as family formation, family structure, religion, parenting behaviors, intergenerational relations, and family/ work balance, etc., also play important factors in immigrants' differential patterns in diet from natives as well as food choice changes over time (Ribar 2013). Thomas (2006) finds that as immigrants settle into their new lives, their opportunity cost to go through a process of acculturation to Western diets is significant. The process is associated with shifts from traditional ethnic menu featuring vegetables and whole grains to the more processed, high-fat and high-sugar foods that are popular and easily available in the US. Gary et al. (2005) indicates that food choices of newly-arrived immigrants are affected by different availability of food, differences in schedules, cultural differences, and other factors (e.g., the community structure) as their home culture; however, as their time in the U.S. increases, adjustments to differences in language, values, concept of time, family ideology may bring changes to their food habits. For example, among many Asian immigrants, rice remains an important staple, but cereal, sandwiches, and milk may replace other traditional foods. Hill (2010) explains that Asian immigrants in the U.S. cherish the mealtime with family members, especially during the traditional holiday of their home country, such as New Year's Day. Asian culture value cooking and food preparation techniques, including stir-frying, barbecuing, deep-frying, boiling, and steaming, with all ingredients carefully prepared prior to starting the cooking process. As Asian immigrants acculturate, they would adhere to a traditional Asian diet interspersed with

American foods, particularly bread and cereals. Thus, Asian immigrants are expected to engage more in food at home and food preparation at home than Americans.

As patterns of time use are tangible representations of individual identity, the differences between immigrants and natives in the allocation of non-market time, especially time for food choice related activities, may shed light on immigrant's dietary acculturation. The dietary acculturation process highlights a labor/ leisure trade-off that immigrants face. One common empirical finding in the literature is that immigrants are paid less than natives with similar characteristics and skills. This is in part due to the fact that many immigrants, because of less attractive outside options (such as having to go back to their home country), have lower bargaining power with the firm (Peri 2012); skills, job opportunities, and borrowing constraints could also act as barriers or limitations (Ribar 2013). This situation generally leads to immigrants' lower opportunity cost of time (they give up less by spending their time on non-market work activities) as they face barriers from various sources for integration and employment. Thus, immigrants may spend comparatively more time on non-market activities (i.e. household chores) than natives. However, as immigrants increase time in the U.S. and acculturate, they may spend more time on market work and respectively decrease time in activities such as eating and drinking, food preparation and cleanup, and grocery shopping. Hurst (1998) explains immigrants' acculturation from the perspective of employment, which consolidates the immigrant's labor/ leisure trade-off and changes in the time use. He finds that recent immigrants have a higher rate of voluntary job quitting, involuntary job loss, and quits to layoffs than the native-born, due to the lower transferability of skills, poor match of the market-specific skills, and lower wages for the immigrants. However, as immigrants invest in general skills requirement, the differential patterns in employment will diminish and converge to the rates of the native-born. Mazzolari and Ragusa

(2013) document that skilled workers demand more of market substitutes for home production activities, which further strengthens immigrants' labor/ leisure trade-off. As immigrants achieve better employment outcomes, they transition from non-market activities to market activities. Consequently, as ethnic minorities experience lower opportunity costs of time, they would participate more in home production in relative to the market work.

Differences in the allocation of non-market time may also reflect heterogeneity in household productivity, and this may differ across different ethnic groups. The productivity of non-market time is closely related to the shadow price of time and productivity of consumption time (Becker 1965). If ethnic minorities have lower opportunity costs of market time, they may engage more in household production instead of market work. Chassamboulli and Peri (2014) shows that immigrants with less education usually involve more in "household production" services - home services (cleaning, food preparation, gardening, and similar) and personal services (child and elderly care). Anastario and Schmalzbauer (2008) indicate that household responsibilities may hinder immigrant women's economic acculturation. Cortes (2008) identifies that the inflow of less-educated immigrants reduced the cost of those home production services by almost 10 percent over the period 1980-2000, allowing the vast productive potential of highly educated women to be used in the labor market by substituting part of their tasks in household production (Cortes and Tessada 2011). However, studies (Hunt and Gauthier-Loiselle 2010; Kerr and Lincoln 2010) further argue that highly educated immigrants make positive contributions to productivity and employment in the U.S. labor market. These findings are consistent with the idea earlier that immigrants may experience worse employment outcome relative to the natives as they first move to the U.S. As they stay longer and increase education level, however, the differential patterns in employment will diminish and converge to the rates of the native-born.

CHAPTER 3

DATA

The data used in this study is from the 2013 American Time Use Survey (ATUS). The ATUS is conducted by US Bureau of Labor Statistics (BLS) by computer-assisted telephone interviewing. Participants in the ATUS, are drawn from the existing sample of the Current Population Survey (CPS), and are surveyed during every month of the year. The time dairy requires that every minute of the day is accounted for. During the survey, the respondent describes their activities, which the interviewer either records verbatim or, for a limited set of commonly performed activities which are coded using a three-tier scheme, going from top-level activity categories to sub-categories to descriptions of very specific actions that comprise a single third-tier activity (Hammermesh et al. 2005). There are 17 top-level household activity categories. The second and third-tier categories include 79 time use variables[1]. The 2013 wave of the ATUS includes a newly added variable identifying time-use of people who are Asian. Further, the data distinguishes Asians that are immigrants and born in the US. The sufficiently large sample enables us both to draw conclusions about immigrant-native differences and to examine the behavioral changes in food choice decisions across every generation of Asian immigrants. Additionally, sampling weights allow us to generate empirically derived standard errors for estimates, as well as a representative sample. Due to the Federal Government shutdown, there are no ATUS 2013 data for September 30 through October 15.

[1] The 17 top-level categories are Household activities; Personal care; Caring for and helping household members; Caring for and helping non-household members; Working and Work-related Activities; Educational activities; Consumer purchases; Professional and personal care services; Household services; Government services and civic obligations; Eat and drinking; Socializing, relaxing, and leisure; Sports, exercise, and recreation; Religious and spiritual activities; Volunteer activities; Telephone calls; and Traveling. The second- and third-tier categories more briefly categorize top-tier categories.

In total, there are 11,369 respondents in the data set. We exclude non-Asian immigrants (2,309 observations) to focus solely on comparing Asians immigrants with native US citizens. There are 9,060 remaining respondents (Asian and non-Asian) with 399 identified as Asian immigrants. The respondents are assigned to four subgroups according to their immigration status: A subgroup who immigrated as adults (1st generation, n = 245); a subgroup who immigrated as children or adolescents (1.5 generation, n = 81); American born Asians with at least one Asian parent emigrated from Asia (2nd generation, n = 73); and US-born respondents which includes 3rd generation or greater ethnic Asians (Native, n = 8,661). The ATUS surveys one household member and one diary-day per person which prevents us from examining within-family behavior and differences in habitual behavior between immigrants and natives. The variables of interest are four food choice related activities provided by the ATUS: eating and drinking; travel-related eating and drinking; food preparation and cleanup; and grocery shopping[2]. We include explanatory variables to describe the immigrant's socio-economics status, a regional location indicator and whether they live in a metropolitan area (Table 1)[3].

We report the weighted percentage of observations with zero time spent in each of the four types of food-related activities on a diary day (Table 2). A large fraction of the respondents report no time in travel-related eating and drinking (75.8%) and grocery shopping (86.2%), Nearly half (44.6%) report no time in food preparation and cleanup. Only a small fraction (3.7%) report no time spent eating and drinking. Men are significantly more likely to report no time in travel-related

[2] Eating and drinking category captures all eating and drinking not done as work or a volunteer activity, whether the respondent was alone, with others, at home, at a place of purchase, in transit, or somewhere else. Travel-related eating and drinking category includes all traveling related eating and drinking activities, regardless of mode or purpose. Food preparation and cleanup includes food and drink preparation (baking, boiling, cooking, etc.), food presentation (filling pepper, garnishing food, setting the table, serving a meal, etc.), and kitchen and food cleanup (cleaning oven, drying dishes, wiping tables, etc.). Grocery shopping activities are such as buying groceries, ordering groceries, ordering groceries online, paying for groceries, and talking to the produce manager, etc.

[3] For the variable "Urban", 76 observations reported "not identified" as to whether a household was located in a metropolitan area, so we dropped those 76 variables.

eating and drinking (76.4% of men vs. 75.2% of women), but surprisingly, they are less likely to report no food preparation or cleanup and no grocery shopping. Single respondents are more likely to report no time in food preparation and cleanup (57.1% of single vs. 39.1% of married) as well as grocery shopping (90.4% of single vs. 84.4% of married). Employed respondents, consistent with our expectations, are more likely to report no time in food preparation and cleanup (46.8% of employed vs. 41.1% of unemployed), and grocery shopping (86.5% of employed vs. 85.8% of unemployed), and less likely in travel-related eating and drinking (72.8% of employed vs. 80.6% unemployed). Households with children are more likely to engage in food preparation at home and grocery shopping, however, they are more likely to report zero minutes in eating and drinking (3.9% of children vs. 3.7% of no children). In line with our expectations, respondents living in urban areas are less likely to report zero in food away from home (75.3% of urban vs. 78.5% of rural) and grocery shopping (86.1% of urban vs. 86.6% of rural), and more likely in food preparation at home (44.7% of urban vs. 44.3% of rural). Notably, the proportions test indicate that all of the socio-demographic indicators are statistically significant at the 0.01 level. It suggests that these variables play a critical impact on the four food choice activities, and there are significantly different time use patterns regarding different demographic groups.

Previous literature (Daunfeldt and Hellström 2007; Zaceiva and Aimmermann 2013; Senia et al. 2014) on the time diary studies suggest that there are three main reasons for the zero reporting issue. First, some activities are occasionally performed. For example, people may only do grocery shopping once in a week – usually on the weekends (Goodman 2008). Similarly, acquisition of food away from home is considered to be an infrequent activity. Second, zeros in time use data may arise from a mismatch between the reference period of the data (the diary day) and the period of interest, which is typically much longer (Stewart 2013). Third, there may be a different

stochastic behavioral process determining the participation decision in a certain activity (Zaceiva and Zimmermann 2013). For example, participation in religious activities is closely related to individual faith. Similarly, the presence of zeros in food preparation at home is closely linked to one's employment status. The employment status determines the choice between time spent on work and household production. Since immigrants may face skills, job opportunities, borrowing constraints and uncontrollable situations as barriers on the job market, they may switch to engage more in household work. In the empirical analysis, we attempt to account for the fraction of observations with zero time in an activity.

In addition, the native-immigrant and generational differences in demographic variables suggests comparing mean values of the four activities is misleading because of zero time allocated to certain activities. We calculate the mean values of each of the four activities by immigration status, the activity participation rate, and conditional mean on engaging in an activity (Table 3). The unconditional and conditional means point out the immigrant-native and generational differences regarding the food choice behaviors in the incidence as well as conditional amounts.

The summary statistics in Table 3 shows that for the dependent variable eating and drinking, although the participation rate is high, not every respondent reports engaging in eating and drinking, especially for 1st and 2nd generation of Asian immigrants (99.6% of 1st generation vs. 98.7% of 2nd generation). This may be because children in immigrant families are more likely than children in native-born families to face the food insecurity problem (Capps et al. 2009; Chilton et al. 2009). In addition, we notice that Asian immigrants spend more time in eating and drinking – on average 80 minutes for immigrants compared to 64 minutes for natives; 7 minutes for immigrants compared to 6.9 minutes for natives conditional on participation. The 1st generation spend on average 5 minutes on travel-related eating and drinking while the 1.5 generation spend 13 minutes

which is statistically different from the 1st generation (Appendix Tables A1-A2.). The participation rate rises from 0.187 to 0385; however, if we control for participation, the 1st generation still spend the most time in travel-related food activities - 33 minutes. The 1st generation Asian immigrants spend the most time in food preparation and cleanup no matter in mean (72 min) or conditional mean (74 min); we find that there is a declining trend in time spent on this activity as generation status moves from 1st, 1.5, to 2nd generation – declining from 72 minutes, 31 minutes, to 23 minutes; and 74 minutes, 65 minutes, to 59 minutes conditional on participation. Smith et al. (2013) examine trends in U.S. home food preparation and consumption from 1965–1966 to 2007–2008, and they found that generally time spent in food preparation decreased significantly for all socioeconomic groups over the study period. This trend corresponds to the pattern shown in travel-related eating and drinking. The 1st generation immigrants also spend the most time on grocery shopping (11 minutes unconditional vs. 67 minutes conditional). This difference is partly attributable to socio-demographic attributes such as age, marriage status and children's presence in the household. (Smith et al. 2013).

For the explanatory variables, the 1st generation immigrants are older than the 1.5 and 2nd generation sample as expected, but not significantly different from the natives. Differences between the subgroups in the remaining demo-economic attributes are also expected given the 13-year age difference between the 1st and 1.5 generation and the 18-year age difference between the 1st and 2nd generation. The 1st generation maintains the lowest rate of being single, which is significantly less than the 1.5 and 2nd generation. There are also considerable differences in the number of children, with the 1st generation having the highest rate of children presence in the household, and this pattern may correspond to their spending the most time in food preparation and cleanup and grocery shopping shown in Table 3. Interestingly, compared to the 1.5 and 2nd

generations, the 1st generation respondents also have higher level of education attainment. This may be because many Asian immigrants achieve their "American dream" by coming to the U.S. for higher education (Le 2001). The Asian immigrant household income are averaged to be $88,393, and the income gap amounts to about $17,800 or 20 percent of the average Asian immigrant household income compared to the natives. The employment rate does not show significant different patterns regarding the immigrant-native difference, with the 1.5 generation having the highest employment rate (71.4%). In addition, the majority population of Asian immigrants tend to congregate in urban, metropolitan areas.

We further disaggregate each immigration group to examine heterogeneous generation effects on the time use. We categorize each generation group based on a sociology research (Zhou 1997; Oropesa and Landale 1997; Zhou and Bankston 1998) to account for physiological similarity, social and historical processes of immigration, as well as linguistic, cultural, and developmental experiences within each group. We divide the 1st generation into three categories according to immigration age: 18-25 years old, 26-40 years old, and over 40 years old. We divide 1.5 generation into three categories according to immigration age: less than 6 years old, 6-12 years old, and 13-18 years old. Finally, 2nd generation is divided into three categories according to parents' immigration status: both immigrant parents, immigrant father only, and immigrant mother only. For the 1st generation, nearly half (48.6 percent) immigrated between 26-40 years old, and 38.2 percent immigrated between 18-25 years old (Table 4). This pattern is consistent with the statistics shown in the U.S. Census Bureau's 2009 American Community Survey (ACS): Of all Asian immigrants residing in the United States in 2009, 81.7 percent were adults of working age (16-64 years old), 12.7 percent were seniors (age 65 and older), and 5.6 percent were youth (under age 16). This effect corresponds to the phenomenon that many Asian Americans came to the United

States to pursue their education and acquire the skills they need to advance their careers. For the 1.5 generation, about 1/3 of the population immigrated to the U.S. before six years old, 6-12 years old, and 13-18 years old, respectively. For the 2nd generation population, about 74 percent have both immigrant parents, only 5 percent of them have immigrant father only, and 20.5 percent have immigrant mother only. The 2nd generation who have both immigrant parents bear substantial costs of acculturation such as household responsibilities, although 2nd generation Americans look much more like higher-order generation natives than like immigrants (Burda et al. 2013; Hammermesh and Trejo 2013) since they are native born and have the greatest opportunity to immense with American culture than their parents. As Lee and Pacini-Ketchabaw (2011) suggest, extraordinary household responsibilities may compete with the time that immigrant children are able to devote to school, interfering with the acculturation of the 2nd generation. Thus, we expect the estimation results to show that immigrants whose immigration age is younger acculturate faster, and the 2nd generation whose parents are also both immigrants may experience difficulty in acculturation.

We compare the ATUS sample to the Integrated Public Use Microdata Series (IPUMS) USA data, which provides a more extensive survey of Asian immigrant populations, to see if the ATUS data is representative of Asian immigrants in the U.S. (Table 5). The IPUMS dataset consists of over sixty high-precision samples of the American population drawn from fifteen Federal Censuses, from the American Community Surveys of 2000-2013, and from the Puerto Rican Community Surveys of 2005-2013. We compare socio-economic attributes for the 1st, 1.5, and 2nd generation Asian immigrants, and natives. Overall, according to t-test with explanatory variables in Table 3, we find that our ATUS sample is not significantly different than the broader IPUMS sample with the exception for a few demographic characteristics. Education is statistically

different because of coding differences between IPUMS and ATUS[4]. Household income is different because IPUMS calculates total pre-tax income earned by one's family whereas ATUS calculates a family's total annual income. Thus, we conclude the ATUS sample we use in this study are representative of the Asian immigrant and native population.

[4] IPUMS: 0-11 represent no schooling to 5+ years of college; ATUS: 10-43 represent less than 1st grade to doctoral degree

CHAPTER 4

ECONOMETRIC METHODOLOGY

4.1. Two-step Heckman Model

As is discussed in Chapter 3, a non-negligible fraction of the respondents reports zero minutes in a particular type of food-related activity. Empirical models with excessive zero values can be estimated using a Tobit model (Zaceiva and Zimmermann 2011; Aguiar 2012) if the zeros are considered as the outcome of choice. This assumes that zero are reported because the individual household member does not participate in an observed activity. The Tobit model is not suitable if there are other underlying reasons for the zero reporting issue. Moreover, Tobit model assumes that error terms are homoscedastic and normally distributed and that the same process underlies the probability of a zero value and the magnitude of a positive value. A violation of these assumptions would result in inconsistent estimators.

Two-part models (Heckman model and double-hurdle model), may be preferable to Tobit and are widely used in the time use studies (Möser 2010; Ribar 2013; Hammermesh and Trejo 2013). Two-part models can provide a better fit to the data by relaxing the Tobit assumptions, and they can account for different determinants for the zero reporting issue occurred in the time dairy date. In particular, these models allow zeros generated from the stochastic behavioral process underlying the participation decision in a certain activity. In this paper, we utilize the Heckman two-step selection model that allows for correlation between errors in the 1st stage model (the participation equation) and the 2nd stage model (the extensive equation)[5].

[5] Cragg (1971) first presented a version of the double-hurdle model, in which the error terms were assumed to be independent. Jones (1992) and Angrist (2001) derived the likelihood function of the double-hurdle model with dependent errors; however, Smith (2003) theoretically tested the dependent double-hurdle (DDH) model and concluded DDH model contains too little statistical information to support estimation dependency, even when dependency is truly present.

Using the Heckman framework, let y_i^* be a latent variable for the unobserved propensity to undertake each of the food choice decision, and d_i^* denotes a latent equation determining the participating in such activities. The observed time spent on a certain activity is described as follows:

$$y_i = \begin{cases} y_i^* \text{ if } d_i^* > 0 \text{ and } y_i^* > 0 \\ 0 \text{ otherwise} \end{cases} \quad (1)$$

where $y_i^* = x_i\beta + \varepsilon_i$ and $d_i^* = z_i\gamma + v_i$ and $x_i$and $v_i$are the vectors of explanatory variables. The errors in two latent equations are assumed to be normally distributed, and may be correlated with the correlation coefficient. Note that since the estimated coefficient for the first step probit model has no simple interpretation, marginal effects have to be estimated to achieve interpretable results. Furthermore, we transform the dependent variable into log terms in the second step, approximating large values of y.

There are substantial differences in behavior within generations of immigrants which vary according to the time of stay in the host country (Hamermesh and Trejo 2013; Zaceiva and Zimmermann 2013). As such, we estimate equation (1) using the Heckman two-step approach for each of the previously discussed immigrant groups: the 1st, 1.5 and 2nd generation.

It is important to note that although the two-step model literature makes no specific reference to the need for exclusion restrictions, in practice many model applications include those (Humphreys 2010). With a valid exclusion restriction, the inverse Mills ratio and the explanatory variables in the substantive equation will be less correlated, reducing multicollinearity among predictors as well as the correlation between error terms (Bushway 2007). We follow Carlin and Flood (1997) and Zaceiva and Zimmermann (2013)'s method to use diary days and seasonal dummies as the exclusion restriction. Since people are randomly interviewed, diary day and season can identify participation in a given activity, but not the extent of their participation.

4.2. Heterogeneity of ethnicity effect

To examine potential longitudinal changes in Asian immigrant's food choice behaviors, we estimate the impact of time since immigration on immigrants' time use. Since the time of residence in the U.S. is considered as a marker for acculturation, this estimation will shed light on immigrants' dietary acculturation and the acculturation rate with respect to the 1st and 1.5 generation immigrants. Specifically, we will identify whether time since immigration plays a role in changes of Asian immigrant's dietary behaviors, and how long until the 1st and 1.5 generation Asian immigrants acculturate into American way of eating and drinking, travel-related eating and drinking, food preparation and management, and grocery shopping.

To address this research question, we specify a model to identify the impact of the year since immigration on the four time use activities. The base model takes on the following form:

$$Time\ use = \alpha + \beta YSM + \gamma YSM^2 + \delta X + \varepsilon \quad (2)$$

The dependent variable $Time\ use$ corresponds to eating and drinking, travel-related eating and drinking, food preparation and cleanup, and grocery shopping respectively. This is expressed as a function of year since immigration, YSM; a quadratic year since immigration variable to see if there is a diminishing or increasing rate of acculturation, YSM^2, and demo-economic variables, X. The vectors of parameters β, γ, and δ are the effects of YSM, YSM^2, and X on $Time\ use$, respectively, and ε represents the vector of error terms.

Given heterogeneous immigration patterns, among our groups, we next specify a more disaggregate model:

$$Time\ use = \alpha + \beta(D_1 + D_2 + D_3)1st\ Generation + \gamma(D_4 + D_5 + D_6)1.5\ Generation + \delta(D_7 + D_8 + D_9)2nd\ Generation + \epsilon X + \varepsilon \quad (3)$$

where D_i (i = 1, 2, ⋯ , 9) are dummy variables for each of the previously discussed sub-groups within each generation group. We treat Natives as the base group. X is a vector of demographic variables. $\beta, \gamma, \delta,$ and ϵ are the effects of the 1st generation, 1.5 generation, 2nd generation, and demographic variables on $Time\ use$, respectively. ε represents vector of error terms that are assumed to be normally distributed, and may be correlated with the correlation coefficient.

CHAPTER 5

ESTIMATION RESULTS

5.1. Time spent on eating and drinking

We estimate equation (1) to determine whether different types of Asian immigrants (1st, 1.5 and 2nd generation) allocate their time to food choice decisions differently than US born non-Asians. The empirical estimates of time spent on eating and drinking are consistent with the summary statistics. We find significant effects from both participation and level equations for the 1st and 1.5 generations. The 1st generation Asian immigrants participate 16.4 percent more in eating and drinking, and the 1.5 generation participate 19.6 percent more time than natives. Also, the 1st generation spend 83.6 percent more minutes on a diary day than natives on eating and drinking. This effect disappears with the 2nd generation as the time spent eating and drinking is not significantly different between the 2nd generation immigrant and the natives. This large difference may be due to the willingness and ability to devote time to this activity or cultural preferences because of different cooking traditions (Zaceiva and Zimmermann 2013). The lack of difference for the 2nd generation time use associated with eating and drinking may indicate dietary acculturation. Pan et al. (1999) examine the change of eating patterns in Asian students after living in the U.S., and they find the number of students consuming only two meals per day increased significantly and more students skipped breakfast because of their school schedules. Mellin-Olsen and Wandel (2005) study the changes in food habits among Pakistani immigrant women in Oslo, Norway and they find that their meal patterns changed significantly as their stay in a foreign country increases. Specifically, the cultural importance of breakfast and lunch diminished and meals on working days lost importance to meals on weekends. Popovic-Lipovac and Strasser (2013) further show that busier lifestyle, lack of social relations, higher level of stress, food

insecurity, and lack of traditional foods may contribute to the dietary acculturation. In addition, the significant shift in participation and level of engagement from the 1st generation to the 2nd generation may correspond to the work/ leisure trade-off faced by immigrants. As Asian immigrants first settle in the U.S., they may face a lower opportunity cost of time associated with lower market wages. Consequently, the 1st generation can devote a larger portion of time to household production activities, such as eating and drinking. As immigrants' level of education increases and conquer a series of barriers that impede them finding a job, they would be expected to transition from non-market work to market work, thus increasing the opportunity cost of time.

The coefficient estimates suggest that age has a non-linear effect. Both the participation and time spent eating and drinking will decrease with age at an increasing rate. This pattern is consistent with our physiological expectations: older people tend to consume less than young adults to reduce calorie intake (Anderson and Prior 2007). Notably this effect also shows that although immigrants of younger generation participate or engage less in eating and drinking than older generations, younger people in general still participate and engage more than older people. Female respondents participate less in eating and drinking, while their total time spent eating and drinking is the same as men. Being single negatively affects both the length of time spent on eating and drinking as well as the decision to spend time on it. We also find that higher levels of education are associated with more time spent eating and drinking. This pattern is in line with the previous research which suggest investments in human capital via formal education can improve dietary quality and decrease food insecurity (Dixon et al. 2000; Darmon and Drewnowski 2008; Berning and Hogan 2014). As might be expected, family income has a significantly positive impact on the decision to eat and drink and the amount of time allocated to eating and drinking, indicating that eating and drinking are normal goods. The presence of children also has a generally positive impact

on time spent eating and drinking. This could be that children's dietary behaviors complement their parents' behaviors. Not surprisingly, being employed has an unambiguously negative and significant association with the amount of time eating and drinking, which strengthens the viewpoint that employed people are usually associated with busier schedule that they would reduce time eating and drinking.

5.2. Time spent on travel-related eating and drinking

The results of travel-related eating and drinking show that the 1st generation immigrants spend 17.1 percent less in travel-related eating and drinking on a diary day than natives. Alternatively, the 1.5 generation spend 27.8 percent more minutes. This approximate 35 percent gap on time spent on travel-related eating and drinking between the 1st and 1.5 generation comes entirely from the participation equation. The 2nd generation shows no difference in travel-related eating and drinking than natives. Combining results from eating and drinking, the empirical estimates of travel-related eating and drinking suggest that Asian immigrants transition from consuming food at home (FAH) to consuming food away from home (FAFH). Specifically, Asian immigrants who immigrated at a relatively older age (1st generation) tend to engage more in FAH, and those who immigrated at a younger age (1.5 generation) like to travel to eat and drink. Our finding is in line with previous literature. Yen (2012) and Owusu-Amankwah (2014) show that race plays a significant role in FAFH consumption. Specifically, white households, compared with other races, are more likely to consume in a full-service restaurant. This pattern corresponds to the broad availability of fast food and sit-down restaurants in the U.S. Furthermore, Mellin-Olsen and Wandel (2005) find that children's preferences, work schedules, social relations, stress, traditional beliefs, climate, season and access to foods would lead to the dietary acculturation among immigrant households.

Age has a non-linear effect indicating the level of engagement of travel-related eating and drinking decreases with age at an increasing rate. This suggests that younger people on general engage more in FAFH. Females spend 5.7 percent more minutes than males in travel-related eating and drinking, which is consistent with our expectation that the higher employment rate for men usually corresponds to busier work schedule and a more limited time budget, leading to more food consumption away from home. Education also tends to have a significantly positive effect on the time spent. This shows that higher educated respondents devote more time to FAFH consumption, which could be due to such respondents being more likely to work outside of the home. This is in line with the results reported by Mancino and Newman (2007) and Senia et al. (2014). Employment status is also an important indicator, with employed people spending 14.2 percent more than unemployed respondents. Household income has a small, but positive effect on the amount of time traveling. This result suggests that travel-related eating and drinking is also a normal good as people with higher income have greater purchasing power and can afford more meals away from home.

5.3. Time spent on food preparation and cleanup

The 1st generation are more likely to participate in food preparation and cleanup and devote more time doing on a diary day than natives. There are no significant effects on the 1.5 and 2nd generation, indicating that they present no difference than natives. Compared with eating and drinking and travel-related eating and drinking, the significant pattern in food preparation and cleanup suggests that Asian immigrants acculturate relatively more rapidly for this activity. As a traditional home production activity, the significant effect of food preparation and cleanup highlights the work/ leisure trade-off that immigrants face. Cortes (2008) and Cortes and Tessada (2011) find that low-skilled immigrants, usually female immigrants, have lower wages and lower opportunity cost of

time compared with natives, so they tend to invest in the production of household goods other than services available in the market. Mazzolari and Ragusa (2013) argue that immigrants contribute significantly to the household services sector, by reducing its market cost and expanding its size. This is mainly due to the fact that immigrants face disadvantages in the labor market with inappropriate job skills, language barriers and lower levels of education.

This finding also suggests an acculturation process with regards to time spent on household food production. Mancino and Newman (2006, 2007) and Kung (2010) propose Asian immigrants are the group that spends the most time in food management activities. However, American food culture is more associated with "fast food", where people pay less attention to the food preparation process. While we observe that the 1st generation still participate or spend more time on food preparation and cleanup than the native group, the 1.5 and 2nd generation appear acculturated into the American food tradition.

Results for demographic variables are in line with our expectations. Age plays a significant impact on food preparation and cleanup – older respondents spend more time in food preparation. This effect could be due to the fact that older respondents (i.e. retirees) have a lower opportunity cost of time, use more basic ingredients and "raw" foods or buy fewer pre-prepared convenient foods due to their greater knowledge of cooking methods (Aguiar and Hurst 2005, 2007; Tashiro 2009; Senia et al. 2014). Not surprisingly, women immigrants spend on average 56.3 percent more on a diary day than men in food preparation and cleanup. Single respondents spend 13.7 percent fewer minutes than married ones, and households with children spend 35.7 percent more minutes in this activity. This effect shows that the relative value of time preparing home at home are higher if children are present. Moreover, employed respondents spend less time in food preparation, which is consistent with our previous findings. Household income has a small but significantly

negative effect on the participation rate of food management activity, showing food preparation and cleanup is inferior.

5.4. Time spent on grocery shopping

The immigration status does significant impact the decision to participate and allocate time to grocery shopping, indicating that Asian immigrants do not behave significantly differently than natives in regard to grocery shopping. However, the significance of empirical estimates of the demographic indicators are consistent with our expectations. Similar to food preparation and cleanup, the engagement in grocery shopping increases with age at a decreasing rate. This result may due to the effect that people will increase time in grocery shopping significantly after marriage, and this effect will steadily increase since then (Gustat et al. 2015). Female immigrants on average spend 24.4 percent more minutes on a diary day on grocery shopping than men. In addition, consistent with our previous finding, higher educated immigrants would spend 0.9 percent more minutes on grocery shopping. This effect is interesting and relevant literature suggest that grocery shopping involves a great deal of reading activity and may need knowledge of nutrition, ingredients, and foods variety to choose from a variety of products (Fusillo and Beloian 1977) and higher educated people have more access to healthy food (Cummins and Macintyre 2006). However, household income seems to have no impact on grocery shopping at all, which is contrary to our expectation. However, as the general grocery shopping can be considered as staple shopping, which is an inferior good, grocery shopping would not increase as household income increases.

Finally, Heckman two-step estimation result reports rho (the inverse hyperbolic tangent of rho), the correlation of the residuals in the two equations, and the likelihood ratio test of rho = 0. We find that all of our Heckman two-step estimations report non-zero rho and the likelihood ratio tests are significant, meaning that the errors in the two equations are not independent. The above

estimates indicate non-zero correlations between the error terms and confirm that the two-step Heckman model is of better choice.

CHAPTER 6

HETEROGENEITY OF THE ETHNICITY EFFECT

6.1. Impact of year since immigration on the time use

The results in Chapter 5 suggest that ethnicity matters for time use in food choice decisions and generation status has an effect on the dietary acculturation process and rate. In this section, we look into the longitudinal changes on four food-related activities within the 1st and 1.5 generation Asian immigrants by examining the impacts of year since immigration on their time use. Estimation in this chapter will shed light on the heterogeneity patterns within each immigration group and help to understand the acculturation process and rate of acculturation.

We estimate equation (2) using only the 1st and 1.5 generation populations. The 1st generation immigrants show significant acculturation effect on eating and drinking and travel-related eating and drinking as time since immigration increases (Table 7). For eating and drinking, the 1st generation spend less time on eating and drinking as they stay longer in the U.S. This result corresponds to the behavioral change experienced by the 1.5 and 2nd generation previously shown. The empirical estimation indicates that, on average, the 1st generation adjusts their eating and drinking time allocation to be consistent with the native population after 18.5 years[6]. This relatively long period of acculturation shows that the 1st generation Asian immigrants remain eating and drinking habit from their country of origin for nearly 19 years, although gradually changing over time. As the 1st generation population are averaged to be 45.97 years old, 18.5 years of acculturation means they would not complete behavioral changes in eating and drinking until 64 years old, which plays a potentially significant impact on the time use of eating and drinking

[6] The F.O.C. on the time since immigration and its square for the regression in Table 7 is $\widehat{\beta_0} + 2\widehat{\beta_1} = 0$. By substituting variable "year since immigration" as $\widehat{\beta_0}$ and "year since immigration squared" as $\widehat{\beta_1}$, we can calculate year of acculturation.

for the 1.5 and 2nd generation immigrants in their household. Recent studies show similar results for the effect of year since immigration on dietary acculturation. Rosenmöller et al. (2011) find that longer length of residence among Chinese immigrants was associated with an increase in portion sizes and greater consumption of convenience food. Cheung et al. (2010) identify a sensitive period for acculturation: People are better able to identify with a host culture the longer their exposure to it, but only if this exposure occurs when they are relatively young. Although this result is in line with previous findings, it is not very reliable since the quadratic term of year since immigration is not significant.

For travel-related eating and drinking, the time since immigration plays a significant impact on the level equation. The 1st generation would spend significantly less time in FAFH as year since immigration increases, but at a decreasing rate. This result is contrary to our expectation since Chapter 5 indicates that dietary acculturation works for the 1.5 and 2nd generation as they significantly increase time in FAFH. However, the results here suggest a move away from acculturation for the 1st generation: not only do 1st generation have less travel time, but they continue to allocate less and less over time. This heterogeneity pattern suggests that year since immigration, age, and immigration age play critical factors in the acculturation process. Since the 1st generation immigrants are averaged to be middle-age population, and as they become older, they may be more willing to cook at home instead dining outside. Yen (2012) and Owusu-Amankwah (2014) show that FAFH is related with age, and younger people are significantly more willing to engage in FAFH. Roshania (2008) find that dietary acculturation nearly has no impact on immigrants who arrived at more than 50 years of age. Similarly, Hintermair (2008) show that people who immigrated at an older age are less willing to acculturate, and they show a slight tendency to marginal acculturation.

As expected, impacts of time since immigration for the 1.5 generation are not significant, indicating the 1.5 generation do not significantly change time use behaviors in food choices as they stay longer in the U.S. This could suggest that the 1.5 generation is more likely to acculturate immediately or at a faster rate than the 1st generation. These results indicate that compared to their parents (1st generation), the 1.5 generation have an easier time fitting into the American food culture or even do not experience any difficulty in cultural adjustment. Previous literature suggests that younger generations spend less time than their parents adjusting to new cultures; people who immigrated to the U.S. at an earlier age present more American behaviors relative to their home country cultures, and they generally demonstrate a sense of belonging to the American culture (Cortes 2004; Portes et al. 2005; Miller et al. 2009).

6.2. Impact of generation status on time use among disaggregated immigration age groups

Importantly, there may be substantial differences in behavior within the immigrant groups (Zaceiva and Zimmermann 2011, 2013; Ruiz 2013). We estimate equation (3) using the Heckman two-step model for the four time use activities (Table 8)[7] and treat Natives as the base group. However, since the sample size for each group is small, results should be interpreted with caution.

For the 1st generation, immigrants of working age (age 18 – 40) show a significant difference from natives with respect to eating and drinking. This effect confirms the phenomenon that younger people tend to acculturate faster than older immigrants. We can conclude that those who immigrated between 18-40 years old contributed the most to the overall acculturation effect on eating and drinking, where the effect of immigration age over 40 is minimal. The same effect also applies to food preparation and cleanup. We find that the group with immigration age 18-40

[7] Since the sample size for variables "immigrant father only" (N = 4) and "immigrant mother only" (N = 15) is small, using these variables in the regression would cause misinterpretation. We then combine these two variables and create "immigrant father or mother" (N =19) in this section to account for 2nd generation immigration effect.

participate significantly more in food preparation and cleanup compared with natives. Particularly those with immigration age 18-25, who not only participate significantly more in food preparation at home, but they also spend more minutes in this activity. This result is consistent with Mancino and Newman (2007) who find for high-income households, working Asian women spend approximately 11-20 more minutes per day preparing food compared with non-Hispanic White women. This effect also shows that younger working age adults (aged 18-40) contribute, to a large extent, to the significantly positive impact in Table 6; however, we cannot conclude if they are the very group that acculturates faster than their older counterparts, since the effect of year since immigration on food preparation and cleanup is not significant in Table 7. Similarly, the 1st generation whose immigration age 18-25 spend significantly more in grocery shopping than those who immigrated at an older age. Although findings from Table 6 and Table 7 show generation status presents no significant impact regarding grocery shopping, this result is in line with the finding that education has a positive impact on grocery shopping, since the 1st generation whose immigration age 18-25 more likely than other groups came to the U.S. to pursue higher education (Hill et al. 2005).

For the 1.5 generation, the significant effect comes from the level equation in travel-related eating and drinking for people immigrated between 6 and 12 years old. They spend 48.1 percent more minutes in FAFH than the base group. In addition, the group with immigration age 12-18 participate 67.1 percent more in FAFH than natives. This result corresponds to the significant pattern in Table 6. We can conclude that it is Asian immigrants with relatively older immigration age who contribute to the significantly different pattern compared with natives. It further consolidates the finding that people who immigrated at older ages associate with greater identification with the culture from their mainstream and heritage cultures instead of that of the

host country. For the empirical estimates of the 2nd generation, subgroups show no significant effects on any of the four time use activities. However, the relatively small sample size for the 2nd generation indicates this result might not be very reliable.

CHAPTER 7

CONCLUSION AND IMPLICATION

Our research focuses on the behavioral changes related to food choice decisions among generations of Asian immigrants, in particular, the changes in immigrants' food habit and their acculturation into the American food culture. Notably, the empirical estimates suggest a decline in eating and drinking, food preparation and cleanup, and grocery shopping towards food away from home consumption (travel-related eating and drinking) from the 1st generation immigrants to the 2nd generation. Moreover, we find that immigrants' food choice decisions are also influenced by socioeconomics characteristics and household composition.

Changes in the use of time and structure of activities related to eating and drinking have crucial implications for individual health and public policies targeting food-related behaviors. According to previous studies, obesity among immigrants as their time spent in the U.S. increase over time (Singh and Miller 2003), the nation's rising overweight/obesity levels becomes a public concern (Amy Kraushaar 2014), and immigrants are exposed to higher risk of being overweight for 1st generations (Liu and Waldorf 2012).

These changes and the corresponding consequences underscore the importance of a comprehensive investigation of food-related time use in Asian immigrant households. It may be beneficial to target nutrition education programs to immigrants, especially the 1st generation. While it might be valuable to provide more conventional nutrition education, it is also important to help Asian immigrants retain healthful food habits from their original country and to encourage them to choose eating patterns of the new culture that are nutritionally sound (Pan et al. 1999). Future health promotion strategies should encourage cultural sensitivity in efforts to reduce the consumption of sugar-sweetened beverage, convenience foods and to encourage eating at home

rather than dining out (Lesser et al. 2014). Finally, nutrition education programs may need to address significant cultural and language barriers.

Moreover, we find that immigrants' food choice decisions are also influenced by socioeconomic characteristics and household composition. Public policy and nutrition assistance programs, such as SNAP, may be more effective accounting for varied characteristics of households by providing assistance especially suited for their own needs.

Given the recent availability of ATUS data on Asian immigrants, further longitudinal examination of acculturation process and components is recommended to examine the trajectories of Asian immigrants' acculturation process (Miller et al. 2009), and how those findings may aid in the development of targeted, culturally sensitive interventions for Asian immigrant populations. Future research may also take into account expanding the immigrant population by incorporating more ethnicity groups to examine the horizontal behavioral changes among generations of ethnicities. Since people from different country of origins present heterogeneous integration levels, and diverse groups in different contexts produce varied results, institutional constraints, including residential segregation, work rules, and visa quotas, provide other ways to test general economic approaches (Ribar 2013), which add to the multiplicity study of time-use outcomes of the behaviors and relationships of various immigrant groups.

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LIST OF TABLES

Table 1. Variable Definitions

Variable	Definition
Time use variable	
Eating and drinking	Eating and drinking
Travel-related to eating and drinking	Eating and drinking: Travel-related to eating and drinking
Food preparation and cleanup	Household activity: Food and drink preparation, presentation, and clean-up
Grocery Shopping	Purchasing goods and services: Grocery shopping
Immigration Attributes	
1st generation	Immigrated as adults (> 18 years old)
1.5 generation	Immigrated as children/adolescents (≤ 18 years old)
2nd generation	American born Asian, with at least one Asian parent immigrated from Asia
Native	American born, including 3rd and so forth generation of Asian immigrants (exclude 2nd generation immigrants elsewhere)
Demo-economic attributes	
Age	Age [years]
Sex	1 if female; 0 male
Single	1 if single (never-married); 0 if married – spouse present; married – spouse absent; widowed; divorced; separated.
Education	Labeled 10-43 ranging from less than 1st grade to doctoral degree (PhD, EdD, etc.)
Household income	Household income [USD: 1000]
South	1 if live in the south, US; 0 otherwise
Northeast	1 if live in the northeast, US; 0 otherwise
West	1 if live in the west, US; 0 otherwise
Midwest	1 if live in the Midwest, US; 0 otherwise
Employment	1 if employed – at work; employed - absent; 0 if unemployed – on layoff; unemployed – looking; not in labor force.
Child	1 if have children under 18 years old; 0 otherwise
Urban	1 if live in metropolitan; 0 otherwise

Table 2. Fraction of Cases with Zero Time in Food Choice Decisions on Diary Day (%) (N=9,060)

	No eating and drinking	No travel-related eating and drinking	No food preparation and cleanup	No grocery shopping
Full sample	3.7	75.8	44.6	86.2
Gender				
Male	**3.9**	**76.4**	**33.2**	**83.1**
Female	**3.6**	**75.2**	**57.0**	**89.6**
Marriage status				
Single	**4.6**	**72.6**	**57.1**	**90.4**
Married	**3.4**	**77.2**	**39.1**	**84.4**
Employment Status				
Employed	**4.2**	**72.8**	**46.8**	**86.5**
Unemployed	**3.0**	**80.6**	**41.1**	**85.8**
Children				
Yes	**3.9**	**77.2**	**34.5**	**84.9**
No	**3.7**	**75.3**	**48.1**	**86.7**
Area				
Urban	**3.6**	**75.3**	**44.7**	**86.1**
Rural	**4.4**	**78.5**	**44.3**	**86.6**
Region				
South	4.8	76.9	47.0	87.5
Northeast	2.6	74.9	43.1	86.3
West	2.8	73.2	41.4	86.6
Midwest	3.7	76.7	44.5	84.0

Note: Parameters in bold (italics) are significantly different from zero at $\alpha = 0.01$

Table 3. Summary Statistics

	1st Generation: n=245	1.5 Generation: n=81	2nd Generation: n=73	Native: n=8661
Time use activities (minutes)				
Eating and drinking (mean)	82.109	85.034	67.973	65.496
	(3.862)	(5.995)	(5.901)	(0.703)
Participation Rate	0.996	1.000	0.987	0.991
(conditional mean)	104.940	85.034	103.724	94.998
	(17.567)	(8.095)	(11.484)	(5.027)
Travel-related to eating and drinking (mean)	5.206	12.906	6.901	6.977
	(1.018)	(3.027)	(1.588)	(0.322)
Participation Rate	0.187	0.385	0.193	0.242
(conditional mean)	33.247	21.842	13.179	18.105
	(10.394)	(11.426)	(5.465)	(1.506)
Food preparation and cleanup (mean)	71.972	31.303	23.044	31.240
	(5.882)	(9.492)	(5.486)	(0.659)
Participation Rate	0.731	0.450	0.504	0.550
(conditional mean)	74.308	65.152	59.318	42.150
	(19.811)	(23.479)	(27.295)	(3.089)
Grocery Shopping (mean)	11.323	5.118	6.106	5.916
	(1.933)	(1.817)	(3.041)	(0.238)
Participation Rate	0.178	0.125	0.133	0.137
(conditional mean)	66.501	39.206	43.534	40.416
	(9.836)	(7.931)	(8.167)	(2.480)
Total Food Choice Decisions (mean)	170.610	134.361	102.024	109.630
	(7.826)	(10.747)	(9.888)	(1.090)
Participation Rate	0.984	1.000	0.987	0.977

(conditional mean)	278.996	134.361	219.755	195.668
	(31.257)	(15.756)	(51.420)	(8.159)
Explanatory variables				
Age	45.970	33.350	27.410	46.200
	(1.236)	(1.443)	(1.883)	(0.283)
Sex	0.622	0.469	0.439	0.519
	(0.038)	(0.073)	(0.080)	(0.007)
Single	0.108	0.548	0.742	0.303
	(0.030)	(0.071)	(0.057)	(0.007)
Education	34.429	32.860	27.640	28.620
	(0.873)	(1.426)	(1.419)	(0.134)
Household income	88.070	80.790	97.910	70.590
	(5.243)	(6.908)	(12.290)	(0.823)
South	0.286	0.364	0.121	0.382
	(0.036)	(0.072)	(0.044)	(0.007)
Northeast	0.197	0.189	0.216	0.161
	(0.031)	(0.055)	(0.066)	(0.005)
West	0.372	0.301	0.506	0.186
	(0.040)	(0.061)	(0.084)	(0.006)
Midwest	0.146	0.145	0.157	0.271
	(0.028)	(0.064)	(0.049)	(0.006)
Employment	0.670	0.714	0.405	0.612
	(0.038)	(0.065)	(0.077)	(0.007)
Child	0.484	0.282	0.141	0.253
	(0.040)	(0.058)	(0.039)	(0.005)
Urban	0.975	0.966	0.940	0.810
	(0.010)	(0.022)	(0.035)	(0.006)

Note: Standard errors in parentheses

Table 4. Descriptive Statistics on Immigration Age, Country of Origin, and Generational Status

	Asian Immigrants (N = 438)
Generational Status	
1st generation	0.560
1.5 generation	0.185
2nd generation	0.167
Immigration Age for 1st generation	
18-25	0.392
26-40	0.486
>40	0.122
Immigration Age for 1.5 generation	
<6	0.309
6-12	0.309
13-18	0.382
Parents Immigration Status for 2nd Generation	
Both immigrant parents	0.740
Immigrant father only	0.055
Immigrant mother only	0.205

Table 5: Descriptive Statistics from IPUMS-USA for Asian Immigrants and Natives

Variable	1st Generation	1.5 Generation	2nd Generation	Native
Age	50.240	35.230	34.670	45.910
	(0.070)	(0.092)	(0.118)	(0.018)
Sex	0.547	0.504	0.495	0.514
	(0.002)	(0.004)	(0.004)	(0.000)
Single	0.118	0.447	0.599	0.335
	(0.002)	(0.004)	(0.004)	(0.000)
Education	**7.727**	**7.944**	**7.836**	**7.258**
	(0.014)	(0.018)	(0.017)	(0.002)
Household income	**231.400**	**383.600**	**601.800**	**410.500**
	(3.627)	(8.644)	(12.05)	(1.273)
Employment	0.602	0.689	0.609	0.592
	(0.002)	(0.003)	(0.004)	(0.000)
Urban	0.986	0.983	0.972	0.885
	(0.001)	(0.001)	(0.001)	(0.000)
Observations	80,400	27,711	27,852	1,726,741

Note: 1. Standard errors in parentheses

2. Parameters in bold are significantly different from Table 3's variables at $\alpha = 0.1$

Table 6. Heckman Two-stage Model Estimation (N=8,984)

	Eating and drinking		Travel-related eating and drinking		Food preparation and cleanup		Grocery Shopping	
	Participation	Level	Participation	Level	Participation	Level	Participation	Level
1st Generation	0.164**	0.836**	0.134	-0.171*	0.475***	0.208**	0.236	0.124
	(0.070)	(0.348)	(0.213)	(0.094)	(0.092)	(0.090)	(0.342)	(0.094)
1.5 Generation	0.196*	4.725	0.302	0.278*	0.083	0.039	0.486	-0.109
	(0.115)	(0.236)	(0.299)	(0.146)	(0.154)	(0.149)	(0.576)	(0.182)
2nd Generation	0.064	0.435	-0.010	-0.047	-0.103	0.208	0.032	0.043
	(0.106)	(0.388)	(0.226)	(0.160)	(0.168)	(0.155)	(0.566)	(0.190)
Age	-0.015***	-0.018**	0.004	-0.023***	0.0033	0.037***	-0.081	0.043***
	(0.004)	(0.008)	(0.023)	(0.005)	(0.011)	(0.005)	(0.076)	(0.006)
Age square	0.019***	0.023***	0.001	0.022***	-0.004	-0.032***	0.077	-0.039***
	(0.004)	(0.008)	(0.022)	(0.005)	(0.009)	(0.005)	(0.069)	(0.006)
Sex	-0.053***	-0.057	-0.006	-0.057*	0.001	0.563***	-0.325	0.244***
	(0.019)	(0.049)	(0.068)	(0.030)	(0.139)	(0.028)	(0.424)	(0.034)
Single	-0.076**	-0.128*	0.055	0.027	-0.024	-0.137***	-0.070	0.026
	(0.032)	(0.067)	(0.069)	(0.045)	(0.055)	(0.041)	(0.147)	(0.048)
Education	0.008***	0.007**	0.002	0.009***	-0.002	0.006***	-0.018	0.009***
	(0.001)	(0.003)	(0.009)	(0.002)	(0.002)	(0.002)	(0.017)	(0.002)
Household Income	0.001***	0.003***	0.001	0.002***	0.000	-0.001***	0.000	0.000
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
South	-0.020	-0.099*	0.095	-0.021	-0.000	-0.056	0.252	-0.111***
	(0.026)	(0.059)	(0.058)	(0.037)	(0.038)	(0.035)	(0.221)	(0.041)
Northeast	0.057*	0.158*	0.037	-0.025	0.021	0.022	0.097	-0.062
	(0.032)	(0.086)	(0.072)	(0.047)	(0.046)	(0.045)	(0.179)	(0.052)
West	0.038	0.017	0.113	0.036	0.006	0.039	0.008	-0.022
	(0.027)	(0.074)	(0.070)	(0.044)	(0.043)	(0.041)	(0.141)	(0.048)
Employment	0.024	-0.122**	-0.033	0.142***	-0.114**	-0.204***	0.045	-0.036

	(0.026)	(0.059)	(0.142)	(0.037)	(0.057)	(0.034)	(0.130)	(0.040)
Child	0.018	0.119*	-0.050	-0.039	0.077	0.357***	0.039	0.038
	(0.027)	(0.063)	(0.067)	(0.039)	(0.094)	(0.037)	(0.140)	(0.043)
Constant	3.995***	1.672***	2.456	-0.602***	4.196***	-1.264***	10.17*	-2.425***
	(0.102)	(0.211)	(1.539)	(0.133)	(0.643)	(0.127)	(5.683)	(0.163)
Urban		0.066		-0.013		-0.004		0.060
		(0.059)		(0.039)		(0.036)		(0.044)
Diary Day		0.003		-0.003		0.004**		-0.002
		(0.003)		(0.002)		(0.002)		(0.002)
Seasonal Dummy		-0.006		-0.000		0.010**		-0.002
		(0.007)		(0.004)		(0.004)		(0.005)
Lambda	-0.836		0.0820		-0.748*		-2.686	
	(0.682)		(1.224)		(0.416)		(2.113)	

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 7. Impacts of Year Since Immigration on the Time use Activities for the 1st and 1.5 Generations

	Eating and drinking	Travel-related eating and drinking		Food preparation and cleanup		Grocery Shopping	
	Participation	Participation	Level	Participation	Level	Participation	Level
1st Generation (N = 245)							
Year since immigration	-0.037**	0.061	-0.106***	-0.005	0.001	0.006	0.028
	(0.018)	(0.098)	(0.037)	(0.024)	(0.036)	(0.034)	(0.037)
Year since immigration squared	0.001	-0.002	0.003***	0.000	0.001	0.000	-0.001
	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)
Constant	4.264***	5.005*	-0.694	3.783***	-0.336	2.865*	-0.576
	(0.735)	(2.730)	(1.714)	(1.140)	(1.663)	(1.635)	(1.512)
Lambda		-0.938		0.336		0.619	
		(0.915)		(0.525)		(0.668)	
1.5 Generation (N = 81)							
Year since immigration	0.035	0.116	0.117	0.009	0.019	0.347	0.123
	(0.049)	(0.117)	(0.097)	(0.090)	(0.094)	(0.279)	(0.118)
Year since immigration squared	-0.001	-0.001	-0.002	0.001	-0.001	-0.006	-0.003
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.004)	(0.002)
Constant	5.171***	5.746***	-3.934	8.727***	-0.485	4.493	-1.000
	(0.838)	(2.165)	(0.987)	(2.237)	(1.954)	(3.166)	(2.174)
Lambda		0.534		-1.123		0.586	
		(1.154)		(1.126)		(0.453)	

Notes: 1. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

2. Controls are the same as previous regression and are included here

3. Eating and drinking is estimated using simple OLS regression due to inadequate zeros

Table 8. Impacts of Generation Status on Time Use Activities Among Disaggregated Immigration Age Groups (N = 8,984)

	Eating and drinking		Travel-related eating and drinking		Food preparation and cleanup		Grocery Shopping	
	Participation	Level	Participation	Level	Participation	Level	Participation	Level
1st Generation								
18-25 (N = 96)	0.179*	0.466	0.054	-0.187	0.439***	0.263*	-0.132	0.277*
	(0.095)	(0.389)	(0.274)	(0.146)	(0.136)	(0.143)	(0.587)	(0.143)
26-40 (N = 119)	0.158*	4.727	0.170	-0.142	0.502***	0.191	0.619	-0.023
	(0.095)	(0.117)	(0.239)	(0.132)	(0.119)	(0.130)	(0.385)	(0.137)
>40 (N = 30)	0.083	4.567	0.369	-0.201	0.515**	-0.026	0.128	0.114
	(0.167)	(0.673)	(0.484)	(0.282)	(0.234)	(0.240)	(0.754)	(0.264)
1.5 Generation								
<6 (N = 25)	0.137	4.675	0.421	0.401	0.122	-0.329	0.883	-0.390
	(0.183)	(0.398)	(0.449)	(0.256)	(0.310)	(0.265)	(1.265)	(0.372)
6-12 (N = 25)	0.173	4.722	-0.190	0.481*	0.430	0.102	-0.717	0.391
	(0.188)	(0.209)	(0.512)	(0.259)	(0.276)	(0.271)	(1.001)	(0.283)
13-18 (N = 31)	0.237	4.681	0.671*	0.016	-0.223	0.208	1.664	-0.567
	(0.167)	(0.235)	(0.351)	(0.250)	(0.233)	(0.247)	(1.429)	(0.367)
2nd Generation								
Mother/ father (N=19)	0.176	4.911	-0.010	-0.069	-0.218	-0.065	-0.341	0.090
	(0.207)	(0.215)	(0.445)	(0.312)	(0.332)	(0.298)	(1.017)	(0.359)
Both parents (N = 54)	0.057	0.308	0.146	-0.080	0.056	0.223	0.093	0.097
	(0.101)	(0.403)	(0.241)	(0.160)	(0.154)	(0.153)	(0.523)	(0.174)
Constant	3.996***	1.647***	2.566*	-0.604***	4.072***	-1.260***	9.926*	-2.442***
	(0.103)	(0.211)	(1.536)	(0.133)	(0.636)	(0.127)	(5.486)	(0.163)
Lambda	-0.859		0.010		-0.675		-2.582	
	(0.693)		(1.220)		(0.412)		(2.030)	

Notes: 1. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

2. Controls are the same as previous regression and are included here

APPENDIX

Table A1. P-value for Unconditional Means

	1st – 1.5 Generation	1st – 2nd Generation	1st Generation – Natives	1.5 – 2nd Generation	1.5 Generation – Natives	2nd Generation – Natives
Eating and Drinking	0.682	0.045	0.000	0.043	0.001	0.677
Travel-related to eating and drinking	0.016	0.872	0.097	0.019	0.052	0.200
Food preparation and cleanup	0.000	0.000	0.000	0.451	0.995	0.138
Grocery Shopping	0.019	0.148	0.006	0.780	0.663	0.950
Total Food Choice Decisions	0.006	0.000	0.000	0.027	0.022	0.445

Table A2. P-value for Conditional Means

	1st – 1.5 Generation	1st – 2nd Generation	1st Generation – Natives	1.5 – 2nd Generation	1.5 Generation – Natives	2nd Generation – Natives
Eating and Drinking	0.826	0.036	0.000	0.055	0.005	0.903
Travel-related to eating and drinking	0.414	0.742	0.821	0.325	0.407	0.582
Food preparation and cleanup	0.123	0.000	0.000	0.243	0.461	0.305
Grocery Shopping	0.003	0.036	0.000	0.601	0.734	0.698
Total Food Choice Decisions	0.003	0.000	0.000	0.035	0.041	0.378