5-2013

Essays on the Rising Demand for Convenience in Meal Provisioning in the United States

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ESSAYS ON THE RISING DEMAND FOR CONVENIENCE IN MEAL PROVISIONING IN THE UNITED STATES

A Dissertation Presented

by

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Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2013

Department of Economics

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DEDICATION

For my mother, Linda, and my late father, Floyd.

ACKNOWLEDGMENTS

I am deeply grateful to my dissertation advisor, Nancy Folbre, for never wavering in her commitment to helping me finish this project. Thank you, Nancy, for your patience, generosity and guidance during a lengthy research process. Marta Murray-Close, my second committee member, worked hard to help me reconcile and frame empirical results. Sheila Mammen, my "outside member," encouraged me to think about the policy implications of my research. Many other professors outside my committee also mentored me while I was in the graduate program, including Randy Albelda, Gerald Friedman, John Stifler, Lee Badgett, Bob Pollin, Lisa Saunders, Carol Heim, Russell Williams and Brenda Wyss. Finally, I am grateful to those who mentored me during the time that I was working in Washington, D.C., and encouraged me to apply to Ph.D. programs in the first place: Elvira Sisolak, Ken Whang and Betty Menchik.

I am grateful to two experts in the Consumer Expenditure Survey Division of the Bureau of Labor Statistics, Laura Paszkiewicz and Geoffrey Paulin, who answered countless data and coding questions.

I am also grateful to my former coworkers and supervisors at the Massachusetts Budget and Policy Center for discussing my research with me on their own time, including Katrina McCarty, Doug Howgate, Mary Tittman, Justin Anderson, Sonia Chang-Díaz, Owen Walker, Nancy Wagman, Dave Dannning, Noah Berger and Peter Enrich.

I am also grateful to many of my fellow graduate students, who, at different points in the process, offered both moral support and substantive feedback on early drafts,

including Michele Mattingly, Kade Finnoff, Lynn Hatch, Rachel Bouvier, Nasrin Dalirazar, Josh Mason, Mike Carr and Jayoung Yoon.

I am indebted to my dear friends Steph Smulligan-Maldanis and Linda Schneider for keeping tabs on my progress each week and pushing me to work harder.

Finally, I am indebted to my family for inspiring me, believing in me and encouraging me to overcome obstacles. Many thanks to my mother, Linda Hauger; my step-father Jim Hauger; my brother Terry Ohler; my grandmother Vernie Ohler; my cousins David Savage and Michelle Spear; my aunt and uncle Gloria and Ray Pollard; my uncle Winston Marshall; my uncle David Spear; my in-laws Loraine and Robert Hattaway; and, finally, to my devoted wife Amanda Hattaway.

ABSTRACT

ESSAYS ON THE RISING DEMAND FOR

CONVENIENCE IN MEAL PROVISIONING IN THE UNITED STATES

MAY 2013

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Household food budgets offer a window on consumers' demand for convenience. During the 1980s and 1990s, three shifts likely promoted an increase in the share of the food budget devoted to convenient meal options, namely meals out and prepared foods: the growing number of hours that women spent in paid work, the growing opportunity cost of women's time spent doing housework, and the drop in the price of food relative to all other goods. I test whether the impact of these economic trends (on food budget allocation) was mediated by a change in the impact of children on household meal allocation. I find support for this hypothesis in a model of food away expenditures, which likely reflects two unmeasured shifts. First, (own) child care and household production of meals apparently became substitutes rather than complements. Second, a range of both prepared foods and family-friendly restaurants became available.

The growing demand for time-saving meal options, including frozen food and meals out, has important implications for a core determinant of living standards: the ability to harness scale economies from home production of meals. I test whether greater reliance on convenient meals reduced household-level economies of scale. Other factors could mediate against, or even offset such a loss, including technological advances in the production and distribution of food. Using Engel curve analyses, I find that scale economies fell from 1980 to 2000, thereby reducing living standards; my lower- and upper-bound estimates of the drop are 44 percent and 110 percent respectively.

Economies of scale are not simply a function of household size and composition, as standard equivalence scaling techniques suggest; they are affected by the ways that households trade non-market work and market substitutes. This dissertation contributes to the small literature that challenges the validity of fixed-parameter equivalence scales, such as the per capita scale, which ignore household production. I first attach plausible values to scale parameters and then compare equivalent-income trajectories of parents and non-parents across (standard) fixed parameter and (non-standard) time-varying equivalence scales. I present plausible lower- and upper-bound estimates of the rise in income inequality between parents and non-parents.

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CHAPTER 1

INTRODUCTION

Do larger households have more capacity to “economize" than smaller ones? In many cases, the answer is yes; the most obvious example of economizing in the household context is housing itself. When two adults living separately form a single household, the couple enjoys a higher standard of living, because they experience a reduced per capita cost of housing. Because housing needs increase less than proportionately for each additional person, housing is a classic example of a “public good.” As this example suggests, household economies of scale are fundamental to the measurement of living standards; lower per capita expenditures, for a given income level, represent higher living standards.

On the surface, meals appear to be a private, not a public, good; by definition, a given meal cannot be consumed by more than one person. Upon closer inspection, however, meals necessitate a broader view of private and public goods, namely as elements on a spectrum, rather than as a dichotomy. For example, meals can be mapped on to this spectrum of private and public goods; the mapping hinges on whether the costs of a given meal type fall with each subsequent person. Specifically, raw foods that require time to prepare yield the most scale; that is, the time spent preparing meals at home increases less than proportionally with the number of people eating them. In other words, there are declining marginal costs of meals at home. In contrast, the marginal cost of each meal at a restaurant does not fall; the second meal does not cost less than the first, etc. The key exception, of course, is the case where children eat free with the purchase of an adult’s meal. Finally, prepared foods fall in the middle of this spectrum of marginal

costs; certainly the cost of a second or third TV dinner is not less than the first one. However, there are scale economies that arise in the consumption of these meals: one person's time is spent shopping for these items, the implicit cost of which is effectively spread over the entire household.

In Chapter 2, I document the extent to which growing time constraints, technological change, shifting relative food prices and falling household size led households to allocate a falling share of their food budget to raw food. That is, I measure the growing propensity to opt for prepared food and meals out rather than raw food, which offers the greatest scope for economizing.

In Chapter 3, I use Engel curve analyses to measure the loss of economies of scale associated with the shift away from food at home using unprocessed ingredients toward prepared food for use at home and meals out. A subset of these results is employed in Chapter 4 in the calculation of equivalent incomes.

In Chapter 4, I discuss an important implication of the shift away from raw food: an overstatement of parents' well-being relative to their childless counterparts. I compare the equivalent income trajectories of non-elderly married couples with and without children across two types of equivalence scales: those that do account for this change (and others) and those that do not. This exercise highlights the bias associated with standard methods of equivalence scaling, which are not sensitive to changes in households' ability to economize.

In summary, the punch line of the dissertation is three-fold. First, household economies of scale are fundamental to the measurement of living standards. Second, households' ability to harness scale in meal preparation fell during the period under

consideration. Third, by not reflecting this change, standard equivalence scales, which are based on the assumption that the cost of children is relatively low and constant over the period, understate a growing economic divide between married parents and their childless counterparts.

CHAPTER 2

THE IMPACT OF CHILDREN ON THE INCOME ELASTICITY OF DEMAND FOR CONVENIENCE IN MEAL PRODUCTION

> …foods are looking more and more like astronaut fare-concentrated, minimalized, single serve. We buy crust-less, frozen peanut butter and jelly sandwiches and dinner kits that come in their own bowls. (The side dish is going the way of the cloth napkin) (Jackson 2009: 103).

2.1 Introduction

During the 1980s and 1990s, American families allocated a growing share of their food budgets to prepared foods for use at home (e.g. TV dinners) and meals out. Several factors likely drove this shift. First, women worked for pay at increasing rates, reducing the time available for household production (i.e. grocery shopping, cooking, clean-up). Facing a growing time bind and a concomitant growth in the opportunity cost of *not* working for pay, women increasingly sought time-saving meal options. Second, real incomes increased, enticing consumers to try both the growing number of new items in the freezer aisle and new restaurants.[1] Third, food prices shifted in ways that likely made relatively expensive, but convenient, meal options (e.g. meals out and frozen/prepared food) more affordable.

Another factor in this changing economic landscape concerns the impact of children on household decisions regarding meal provisions. On the one hand, children might exert a negative effect on the propensity to opt for convenient meals because they create economies of scale in the household production of meals, which lowers the per-

[1] "Real" income is before-tax household income deflated by the ratio of the 2000 Consumer Price Index (CPI) to the 1980 CPI.

person cost. Further, children consume a significant share of household resources, leaving less available for discretionary or luxury items. On the other hand, the desire to spend time in direct social interaction with children could exert a positive effect on the demand for convenience. If parents place a high value on time spent talking with or teaching children, and find it difficult to combine these activities with meal preparation, they may opt for more expensive meal options.

In this essay, I examine the impact of children on meal choice and how this relationship changes between 1980 and 2000. I begin with a cross-sectional analysis of the relationship between household composition and the allocation of the household food budget to relatively convenient meal options. I divide the household food budget in to three parts: food away from home, prepared food for use at home (e.g. TV dinners) and unprocessed food for use at home (e.g. raw meat and other meal ingredients requiring time inputs to prepare). I define "convenient meals" in terms of the two alternatives to home meal production using unprocessed ingredients, i.e. food away from home and prepared food for use at home. I then explore how the broad changes summarized above (in women's paid work hours, real household incomes and relative food prices) altered the relationship between household composition and the allocation of the household food budget to relatively convenient meal options. Next, I examine the impact of children on the income elasticity of demand for food away and prepared food, controlling for other relevant factors.

My analysis adds value to the empirical literature on household production (and, more narrowly, to the empirical literature on demand for convenience) in three ways.

First, while most studies focus on just two categories of food expenditure (food at home and meals out), I parse food expenditures into three categories: unprocessed food for use at home, prepared food for use at home and meals out. This disaggregation allows me to explore whether demand for convenience varies by presence of children; relative to meals out, prepared foods might be more convenient for households with children while the opposite might be true for households without children.

Second, I examine the impact of children on the income elasticity of demand for convenient meal options in two ways. I interact both a.) household income and the presence of children and b) household income and specific numbers of children per household (i.e. 1, 2 and 3 or more). Although a variety of researchers have examined this interaction term in a given cross section, I trace its value over time.

Third, I build on the relatively small empirical literature that *does* include more disaggregated categories of food by incorporating price ratios.[2] I include two price ratios in the demand model and test the extent to which they countervail each other: the price of food away relative to that of food at home and the price of food relative to that of all non-food items. The former ratio controls for consumers' concern with *relative* prices when allocating expenditures among meal types. That is, the ratio of the price of food away relative to the price of food at home should be inversely related to the food away share.[3] The latter ratio controls for another "substitution effect." During this period, the price of food relative to all else fell; this relative price shift alone could have induced consumers

[2] Studies that analyze demand for convenience using finely-disaggregated food categories include: Park and Capps (1997); Capps, Tedford and Havlicek (1985) and Byrne, Capps and Saha (1998).

[3] Morzuch, Weaver and Helmberger (1980) use a similar approach, though in a time series context; they model the level of wheat planted as a function of the expected price of wheat divided by an index of expected prices for *competing* crops.

to spend more on food, which could appear in the survey as an increase in the share of the food budget spent on meals out.

The essay is organized as follows. Section 2.2 contains a two-part literature review. I first review the theory of household production, focusing on the ways it bridges two other (earlier) microeconomic theories. The main objective of this portion is to illustrate, in general terms, how the household production framework makes it possible to theorize the "demand for convenience." I then summarize empirical evidence that confirms the theory of household production as it relates to meal production. The section concludes with my own theoretical predictions; the nutshell of this discussion is that, in theory, children could either increase or decrease the income elasticity of demand for convenient meal options. Section 2.3 explores the link between the macroeconomic and the microeconomic components of the demand for convenience. This discussion serves two purposes. First, it suggests that rising food away and prepared food shares are not due to rising prices for those goods but rather to rising quantities purchased. Second, it points to the need for relative price ratios in the empirical model. Section 2.4 covers the data, sample selection and summary statistics. Section 2.5 describes the model specification. Section 2.6 contains the empirical results, which point to the following two main conclusions of the chapter. First, in the food away model, the (positive) income effect overshadows the (negative) child effect by 2000; in 1980, this was not the case. This suggests that parents increasingly bought time with their children by outsourcing meal preparation/clean-up. Second, in the prepared food model, the overall relationship between income and the demand for prepared foods remained the same: in both years, the

(negative) income effect overshadows the (positive) child effect. That is, prepared food remained an inferior good in households with children.

2.2 Literature Review: Theory and Empirical Evidence of Demand for Convenience

The three explanations posited above for the growing demand for convenience during this period (i.e. the rising number of women's paid work hours, the rising opportunity cost of unpaid work, rising real household incomes, and changing relative prices) reflect two theoretical frameworks within microeconomics: Becker's model of time allocation (which he calls "the household production function" framework) and Gronau's subsequent household production model.[4] In the next section, I briefly discuss each theoretical framework.

2.2.1 Household production theory and the demand for convenience

> The household production function framework emphasizes the parallel services performed by firms and households as organizational units (Michael and Becker 1973: 388).

Relative to consumer demand theory, Becker's framework expanded consideration of the role of the household in the economy. Specifically, households not only consumed market-provided goods as they do in the standard theory of consumer demand, they also produced non-market goods. Crucially, the two, he argued can often be substituted one for the other.[5] For Becker, the standard consumer demand framework

[4] Like Willis (2008), I will refer to this theoretical framework as "The Gronau Model."

[5] This idea was not new; Reid (1934) theorized that the two can be regarded as substitutes to some extent. Michael and Becker acknowledge Reid's discussion of "changes over time in the nature and methods of household production (defined as unpaid activities carried on by and for household members, but which could be replaced by market goods and services)." What the

"does not provide insight into special substitution or 'complementarity' relations between different goods and time" (1981: 25). Becker's theoretical framework, in contrast, "implies a special relation between goods and time used to produce the same commodity." For example, "parental time and nursery schools are substitutes in the production of children" (Becker 1981: 25). One factor, among others, that drives the use of one over the other is the effect of economies of scale from household production.

Broadly speaking, Becker's household production model is framed around two steps. In the first step (known as the "lower-stage of the optimization problem"), households, like firms, solve an "efficient production problem." That is, they combine inputs for meal provisioning as efficiently as possible. While production inputs in the standard theory of the firm include capital and labor, the production inputs in the following household production model include market goods (e.g. groceries) and labor (which is referred to, instead, as time). Just as capital and labor are assumed to be perfect substitutes in the theory of the firm, so too are both time and market goods in household production theory (Bryant and Zick 2006). Like the standard theory of the firm, household production theory frames this "efficient production problem" as a "cost minimization problem."[6] In the second step, households choose a combination of outputs

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household production approach adds to Reid's approach is "greater emphasis on technical aspects of multi-commodity production" (Michael and Becker 1973: 385).

[6] By framing step one in this way, the cost function can be used to, in turn, define a production possibilities frontier, which reflects the largest combinations of z1 (meals in) and z2 (meals out) that can be produced from a given budget. The marginal rate of transformation between the two outputs is the ratio of the marginal cost of output 2 to that of output 1; these marginal costs are called the shadow costs or shadow prices of the outputs. Richards, Gao and Patterson (1998) describe the "theoretical requirements" pertaining to the "curvature conditions of the cost function," in a relatively accessible way.

(i.e. meals in or out) that maximizes household utility (Deaton and Muellbauer 1980: 245-247).

By separating household production processes in two parts (cost minimization and utility maximization), Becker's theory addresses, and arguably fixes, a weakness in consumer demand theory: "The weakness in the received theory of choice…is the extent to which it relies on differences in tastes to 'explain' behavior when it can neither explain how tastes are formed nor predict their effects" (Michael and Becker 1973: 380). Becker's theory states, for example, that a reduction in the price of some factor of production will shift the production process toward techniques that are more intensive in the use of that factor. However, the relative increase in the use of the factor of production will be larger the greater the elasticities of substitution in *both* production and in consumption, not just in consumption (Michael and Becker 1973: 386).[7]

Becker's theory unified and expanded on two previously-separate theories: consumer demand theory and labor supply theory. For consumer demand theorists, the Beckerian framework "provided a theoretical analysis that includes the cost of time on the same footing as the cost of commodities" (Capps and Havlicek 1987: 22). For labor supply theorists, it expanded the standard labor-leisure model of time allocation by imagining that people allocate their time among *three* activities, namely work in the market, work at home and leisure, rather than just two activities (namely work in the market and leisure).

Unlike standard static labor supply models, Becker's household production model

[7] Given this improvement on standard consumer demand theory, Michael and Becker "advocate a reformulation of the theory of consumer behavior." For them, "[t] he case for the reformulation rests, in part on the inadequacies of the traditional theory of choice and more importantly on the new approach's capacity to generate a wide range of cogent testable hypotheses…" (1973: 378).

expresses women's labor supply elasticity "as a function of preference and household technology parameters (Juster and Stafford 1991: 491)." That is, Becker's household production model yields the prediction that an "evolution" in household technology that make it easier to substitute market goods for own time in household production would yield an increase in women's labor supply elasticity.

> …the broad outlines of [Becker's] theory are observable in the data. Market work and higher wages are strongly associated with meals out. It seems clear that a good deal of the evolution of household technology has been to allow the substitution of goods for own time (meals out and prepared foods at the grocery), and that this development coincides with the rising share of total female work time in the labor market… (Juster and Stafford 1991: 492)

Gronau (1977), a labor supply theorist, developed a variant of Becker's household production model that distinguishes between fixed time costs and variable money costs; specifically, his household production model frames travel mode choice (i.e. car versus public transportation) as the outcome of a decision to minimize overall (time plus money) cost per trip (Juster and Stafford 1991: 487)." Consumers with higher "time values" chose time-saving modes of transportation.

Like transportation mode choice, it is useful to frame meal choice in terms of *fixed* time costs associated with meals in (e.g. grocery shopping, cooking and cleaning) versus *variable* money costs; reflecting on Gronau's approach, Michael and Becker (1973) observe that demand for convenience in meals arises when nonmarket time is a relatively large component of a particular activity.[8] As the following passage suggests, meal preparation is one such activity.

> …consumers … buy time in the form of certain consumer goods and services: the tax consultant…and auto mechanic, as well as the cookbook, ***frozen foods***,

[8] The other two broad categories of empirical applications of the household production model, according to Michael and Becker (1973) include more nuanced labor supply studies and fertility studies.

> vacuum cleaner and television set are all in some measure time savers. The demand for such items would be quite different if time were not a scarce resource" (389, emphasis added).

By framing meal choice in terms of fixed time costs versus variable money costs, demand for convenience in meals represents, implicitly, willingness to forego the economies of scale that arise from paying the fixed time costs of eating in. In other words, demand for convenience in meals is the opposite of demand for economies of scale from the household production of them.

2.2.2 Theoretical Predictions: Children and the Income Elasticity of Demand

Theoretically, two of the determinants of the willingness to pay the fixed costs of eating in, namely income and the presence of children, work in opposite directions. That is, a higher income (or wage) represents a higher opportunity cost of paying these fixed time costs of cooking; a higher opportunity cost should, theoretically, prompt consumers to opt out of paying the fixed time costs associated with cooking. Stated in more technical terms, the key prediction of the household production models developed by Becker and Gronau is: a rise in a woman's market wage, holding household size, technology and prices constant, leads to a reduction in home-produced goods (i.e. meals), as long as the substitution effect dominates the income effect. That is, households will substitute away from time-intensive commodities to goods-intensive ones when women's opportunity cost of home production increases.

In contrast, consumers' willingness to pay the fixed time costs of cooking should increase when children are present: "…the presence of children will generally increase time spent in the production of meals because of economies of scale in internally-

produced meals versus constant returns in the supply of externally-produced meals (Gramm 1974: 132)."

Interacting the two variables, household income and presence of children, raises a new question: How do children affect the income elasticity of demand for convenient meals? Specifically, might the effect of children on the income elasticity of demand for prepared food differ from that for meals out?

A. Meals out

On one hand, children might *increase* the income elasticity of demand for meals out because parents considering cooking at home have a particularly high-value alternative use of time; by cooking, parents have to forego spending time interacting with their children, an activity which they clearly value (Kimmel and Connelly 2007). I refer to this as the "quality time effect" below. On the other hand, children might *decrease* the income elasticity of demand for meals out because, as mentioned above, economies of scale exist in internally-produced meals, whereas there are constant returns to externally-produced meals. I refer to this as the "scale effect" below. Also, parents risk being embarrassed by young children at restaurants, an idea depicted by the cartoons in Appendix D. Managing children's behavior at restaurants to minimize this risk, takes energy; parents presumably do not need to expend this energy if they eat at home.

B. Prepared food

The quality time argument applies to prepared food; if parents face a relatively high opportunity cost of shopping and cleaning up, then the presence of children should theoretically increase the income elasticity of demand for prepared food. However, if people buy prepared and unprocessed foods during the same shopping trip, this argument

is weakened. That is, a positive effect of children on the income elasticity of demand for prepared food would occur if parents place a relatively high value on ridding themselves of post-meal chores (such as washing the dishes).

Prepared foods offer one key advantage over meals out: while they offer most of the time savings of meals out, they present none of the risk of being embarrassed by ill-mannered children. The interaction term would be positive if parents want to avoid the risk of being embarrassed by their children in restaurants.

Children might *decrease* the income elasticity of demand for prepared foods because, as mentioned above, economies of scale exist in internally-produced meals, whereas there are constant returns in meals comprised of prepared items. That is, each subsequent frozen meal does not become cheaper after the first one is purchased

In summary, household production theory offers clear predictions of how several variables should, individually, affect demand for convenience in meals. Two key variables, household income and presence of children, could, in theory, offset one another; the interaction of the two offers an indirect measure of the marginal time cost of children to parents.

2.2.3 Demand for convenience in meal provisioning: empirical evidence

Overall, empirical evidence supports the predictions of this household production framework pertaining to household income, women's labor force attachment, household composition and size and market prices, for the period under consideration.

2.2.3.1 Women's wages and household income

Senauer, Sahn and Alderman (1986) compare demand for commercially-supplied bread and home cooked rice in Sri Lanka; preparation of rice requires more time than

commercially-supplied bread. They review two measures of demand: (women's) wage and household income elasticities of demand for bread and rice, evaluated at the means of (women's) wage and household income. The wage rate is included to represent the opportunity cost of cooking. As expected, the elasticity with respect to the woman's value of time is 0.13 for bread, at the mean, and -0.07 for rice, indicating that bread is a "normal" good, while rice is an "inferior" good. The household income results are less dramatic but still consistent with the theory: the income elasticity of demand for bread (of 0.18) was slightly larger than that of rice (of 0.15). These results support the intuition that a higher opportunity cost of cooking leads women to choose market substitutes for their own time.

Turning to the income elasticity of demand for food away versus that for food at home, studies consistently produce the expected result: the former is higher than the latter (Tyrell and Mount 1987; Park, Holcomb, Curry-Raper and Capps 1996). Separating the likelihood of purchase from the amount spent on food away, scholars find that household income is positively correlated with the *likelihood* of eating away from home (Lee and Brown 1986; Weagley and Norum 1989) and with the *amount* spent at restaurants (Benus, Kmenta and Shapiro 1976; Sexauer 1979; McCracken and Brandt 1987; Magrabi, Chung, Cha and Yang 1991). McCracken and Brandt (1987) add nuance to the latter result: they find that increased income significantly increases expenditures at full-service restaurants but not at fast food restaurants

2.2.3.2 Women's labor force attachment

Regardless of their wage rates, women's additional paid work hours have a positive impact on the purchase of relatively convenient foods, including prepared foods

and meals out. In a given cross section, most researchers find that, households containing a woman that works full time for pay spend more on meals out, compared to those households that contain a woman who does not do so, controlling for household size (Byrne, Capps and Saha 1996; Yen 1993; Horton and Campbell 1991; Jacobs, Shipp and Brown 1989; Cohen 1998; Korenman 1988; Bellante and Foster 1984).[9] McCracken and Brandt (1987) find that women's paid work hours are correlated with fast food expenditures, not with full-service meal expenditures. Women's *part-time* work is not associated with more meals out, which is generally interpreted as evidence that full-time paid work crowds out time that would otherwise be spent in meal preparation (Bellante and Foster 1984).

On a technical note, Sexauer (1979) finds that this relationship between women's paid work hours and their expenditure on meals out options hinges on the specification of the dependent variable. Examining married couples with and without employed wives, he reports that this relationship *does not* hold when the dependent variable is specified as total food away expenditures; it *does* hold, however, when the dependent variable is specified as the proportion of total food expenditures spent on food away.

The evidence on employed women's reliance on prepared foods is mixed. Using relatively broad definitions of prepared food, Redman (1980) uncovers greater reliance on prepared foods among employed women relative to their unemployed counterparts, holding income constant.[10] In contrast, Strober and Weinberg (1980) find no significant

[9] The particular woman traced per household varies by study; this list includes both those studies that refer to the paid work hours of "a woman head of household" and those studies that refer specifically to a "wife."

[10] Redman's definition of prepared foods includes frozen dinners as well as canned goods, prepared bakery products and prepared cake mixes.

relationship between wives' employment and the purchase of a relatively small subset of prepared foods (i.e. TV dinners and frozen pizza). This study echoes an older one, which includes a broader definition of prepared food, but still finds that working wives do not make greater use of convenience products and services than non-working wives (Douglas 1976).[11] Douglas also finds that working wives save time by shopping less frequently, and making "greater use of husbands in shopping activities" than non-working wives (1976: 16). Similarly, authors of earlier studies of working women and convenience foods do not find evidence of a correlation.[12]

2.2.3.3 Market prices

A handful of studies investigate the role of market prices in the growing demand for *convenience* in meals outside and inside the home. Jekanowski, Binkley and Eales (2001) measure demand for convenience outside the home; they compare the relative importance of retail price and market characteristics like retail outlet density (controlling for household demographics) in determining the demand for "fast food." Richards, Gao and Patterson (1998) trace the growth in household "value added" expenditures from 1977-78 through 1987-88. To do this, they subtract the "farm gate price" from the adjusted retail price index; this measure separates the price consumers paid for the food itself from the price they paid for "processing and marketing content." They find that the value consumers place on "processing of raw foods" rose during the 1980s.

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[11] Douglas' definition of "convenience products and services" includes takeout dinners, instant desserts, canned main dishes, baked goods, frozen main dishes, cold cuts, paper plates and cups, laundry services, aerosol carpet cleaner and instant dusting spray.

[12] In her review of early studies of working women and convenience foods, Shapiro (2004) reports that "working women appear to have handled their time problems, at least through the early 1960s, by doing less cooking per meal-buying dessert, skipping the homemade biscuits- rather than by … leading a national stampede toward instant foods."

2.2.3.4 Household composition and size[13]

Using the 1993 Consumer Expenditure Survey, Cohen (1998) finds that each child younger than 2 years old leads to a 4.1 percent reduction in spending on meals out. Children between 2 and 15 reduce spending on meals out by 1.7 percent. Cohen's regression models include many independent variables; in addition to the two variables of interest, namely the number of household members under age 2 and between the ages of 2 and 15, he includes the income, paid work hours and educational attainment of each spouse, dummy variables that account for whether each spouse works in a managerial role, the wife's age, the husband's age minus the wife's age, the couple's race, and dummies for homeownership and residence in an urban area.

Using the 1980-81 Consumer Expenditure Survey, Korenman (1988) compares food away expenditures by both child age *and gender* in married parent households. He finds that boys age 2-15 reduce food away expenditures more than girls in the same age range, though the difference is not statistically significant.[14] Relative to Cohen, Korenman employs a relatively small set of regressors; in addition to the two variables of interest, namely the number of boys and girls under age 2 and between the ages of 2 and 15, he includes the log of per capita expenditure and this variable squared, the paid work hours of each spouse, and a racial dummy. Using the U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey, Lee and Brown (1986) find that overall, girls and boys of all ages reduce food away expenditures; the two exceptions are boys age

[13] Since this is one of the two areas that the present study relates to most directly, this section includes more detail about the data sources and control variables used in each study; the same reasoning applies to section E below.

[14] Korenman (1988) rejects the equality of coefficients (on child age dummies) for one good only: entertainment. That is, entertainment expenditures are significantly higher for boys age 2-15 than for girls in the same age range.

11 to 15 and girls age 3 or less. In addition to the age grouping variables of interest, Lee and Brown include the following regressors: household income; urban, region, race and food stamp program participation dummies; female household head employment and education; the square of household size.

Park and Capps (1997) distinguish between prepared foods that are "ready-to-eat" and those that are "ready-to-cook," using the 1987-88 Nationwide Food Consumption Survey. They find that the presence of both males and females ages 0 to 12 significantly affects the purchase of ready-to-eat meals but not the purchase of ready-to-cook meals. Expenditures on both categories are positively correlated with the presence of teenagers. In addition to the two variables of interest, namely the number of males and females in various age groups, Park and Capps include the log of annual household income, prices for each of the meal types and dummy variables for race of reference person and region.

Similarly, Capps, Tedford and Havlicek (1985) separate prepared foods in to *three* groups, which range from least to most convenient: basic convenience, complex convenience and manufactured convenience. Surprisingly, they find that the share of the food dollar devoted to manufactured convenience foods is not significantly affected by household size. Byrne, Capps and Saha (1998) find mixed results: the presence of children was an important determinant of quick-serve and mid-scale restaurant expenditures but they did not play a significant role in up-scale restaurant expenditures. They suggest that the higher cost of up-scale restaurants is a deterrent for households with children.

Byrne, Capps and Saha (1996) conduct a detailed analysis of the "increased importance of younger household members on food away expenditures" during the 1980s

using data collected by the National Panel Diary Group, a private organization. Specifically, males under 13 contributed only 12 percent as much as the omitted group (namely adult males age 35-49) in 1982; by 1989 this value rose to almost 30 percent. For females under 13, this value rose from 4 percent to 19 percent.

2.2.3.5 Interaction between income and composition/size

What is the predicted impact of children on the income elasticity of demand for convenient meal options? Researchers investigate this question by entering family composition variables and their products with household income in the regression model. The resulting interaction effect characterizes whether the income effect (i.e. the predicted rise in the food share of the total budget, given a rise in income) varies with the presence of children.

Several studies extend the double log food expenditure model employed by Tobin (1950) by adding the interaction term of interest: the product of household size and income.[15] Interestingly, they have different stated goals for including this term but come to the same conclusion: larger households have higher income elasticity of demand for food. Anderson and Vahid (1997) add the interaction term of interest, as well as the square of household size, in order to "better approximate consumption." Using 1941 household food consumption data, they find that the coefficient on income and the product of income by household size were positive, while that of household size alone was negative. In other words, the income effect offsets the drag on food expenditure induced by additional household members. Leamer (1997), in contrast, adds this

[15] The *Journal of Applied Econometrics* devoted the Sept.-Oct. 1997 issue to revisiting Tobin's work on the income-expenditure relationship. According to Leamer (1997), Tobin's model is: log(average family expenditure on food, including that which is consumed away from home) = constant + log(average household income) + log(average family size).

interaction term to improve on the "simple economies of scale adjustment," namely the log of household size. He argues that the income elasticity of demand for food, given by the interaction of family size dummies and household income, yields a more complete picture than the scale estimate alone: the scale adjustment "is not enough to explain the differences in food consumption among families of different size" (Leamer 1997: 539). He shows that large families' food expenditures are relatively income elastic, even after adjusting for the scale economies.

Byrne, Capps and Saha (1996) find that the interaction between household size and income was negative in 1982 but positive by 1989 in a model of expenditures on food away. They attribute the "increased importance" of children to household food away from home expenditures to fast food marketing: "[m]arketers for restaurants, especially fast food establishments, seem to have increased their focus on younger household members, which probably accounts for their rise in relative contributions" (625).

2.3 Empirical trends in the supply of and demand for convenient meal options

While my focus is on the changes that occurred at the micro-level of the individual household, many macro-level changes (within the food industry) occurred between 1980 and 2000, including improved technologies to preserve prepared food for use at home and increased variety and volume of both restaurants and "Home Meal Replacements," a relatively new but rapidly emerging segment of the grocery industry" that is "blurring the distinction between food at home and food away from home" (Jekanowski 1999: 32). In order to control for these macro-level changes that undoubtedly increased demand for convenience in meal production, I include two relative

price ratios in the empirical specifications. These indices are described in more detail in Appendix B. The key point is that the empirical analysis is based on the assumption that macro-level changes that affected demand for convenience are reflected in regional food price indices.[16]

The first half of this section reviews two disparate data series (i.e. sales trends and household budgets) that reflect growing *micro-level* demand for convenience. The last half reviews trends in food price indices, which reflect both micro *and macro*–level changes.

2.3.1 Sales trends (outlet level)

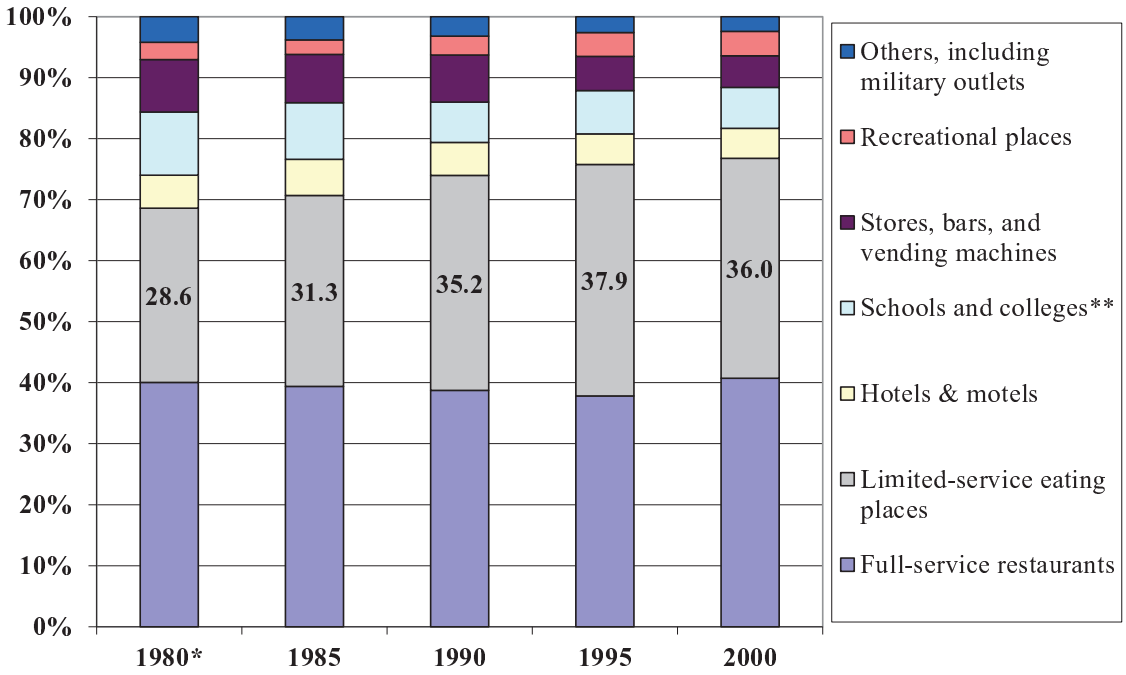
Sales data from grocery stores and restaurants point to increased demand for convenience. Sales of "Home Meal Replacements" in grocery stores more than doubled from 1987 to 1992 (Jekanowski 1999). Drive-through sales doubled between 1984 and 1994 (Kinsey and Senauer 1996)

Dollars allocated for meals out were increasingly spent on fast food rather than full service restaurants during this period, as shown in Chart 2.1. Out of all sales on food away, sales of limited-service meals jumped 7 percentage points, from 29 percent to 36 percent. In contrast, sales at full-service restaurants remained fixed at 40 percent of the total spent on meals away from home. Relative to full-service dining, fast food is likely more attractive to parents both because it is cheaper and also because discipline costs are

[16] Basic microeconomic theory maintains that, for a given level of household demand, an increase in the supply of restaurants (and/or prepared meal options) will reduce prices of those goods; similarly, for a given supply of restaurants (and/or prepared meal options), an increase in household demand will increase the price of those goods. Since both are shifting during this period, the overall effect on the price of these meal types is an empirical, rather than a theoretical, question.

lower than at a full-service restaurant; an unruly child is less of a concern in a fast food restaurant than in a full-service restaurant.

Chart 2.1 Sales of meals and snacks away from home by type of outlet



Source: Economic Research Service, USDA, 2008.
*1980 data reflect the average of 1977 and 1982; data for 1978-1981 are not available.
** Includes child nutrition subsidies.

Schor (2004) finds that this trend toward fast food was particularly pronounced among households with children. Tracing children's diets during roughly the same period, she finds that fast food constituted 10 percent of children's daily caloric intake in the mid-1990s, up from 2 percent twenty years earlier (Schor 2004).

2.3.2 Trends in food budgets (household level)

Household food budgets offer a window in to consumers' demand for convenience. During the 1980s and 1990s, meals were increasingly prepared in ways that saved time. For example, by the early 2000s, just 47 percent of in-home meals included a "fresh" item, such as a vegetable, compared with 56 percent two decades earlier (Jackson 2009).

Table 2.1 illustrates the shift away from buying unprocessed food toward buying both prepared food (and drinks) for use at home and "food away," i.e. restaurant and carryout meals.[17] Both households with and without children increasingly opted for prepared food; both groups increased their prepared food share by five percentage points. The food away shares of these two groups, however, became more similar over time. In 1980, households without children allocated 32 percent of their food budget to meals out, while households with children allocated 27 percent, a difference of five percentage points. By 2000, this difference shrank to just 3 percentage points.

Table 2.1 Food Budget Shares by Presence of Children

	1980	2000	|t value|	Pctg. Pt. Change
Households without children				
Unprocessed food / total food	0.44	0.39	5.68	-0.05
Prepared food for use at home / total food	0.17	0.22	10.94	0.05
Prepared non-alcoholic drinks / total food	0.07	0.08	3.03	0.01
Food away / total food	0.32	0.31	1.18	-0.01
Households with children				
Unprocessed food / total food	0.46	0.39	11.55	-0.07
Prepared food for use at home / total food	0.20	0.25	14.01	0.05
Prepared non-alcoholic drinks* / total food	0.07	0.08	5.22	0.01
Food away / total food	0.27	0.28	0.94	0.01
*Prepared non-alcoholic drinks include bottled sodas and juices.				
Source: Author's calculation based on the diary portion of the 1980 and 2000 Consumer Expenditure Surveys.				

[17] I defined the categories "prepared foods" and "prepared drinks" using components that are otherwise grouped with "food at home" by the Bureau of Labor Statistics (BLS). Appendix A contains a list of the components within each of the categories examined in this essay (food at home, prepared food, prepared drinks and food away).

2.3.3 Food price and quantity trends (economy level)

By definition, food expenditures reflect both *prices* and *quantities*. However, the Consumer Expenditure Survey does not contain these underlying variables. It is not possible to determine, for example, whether an increase in the food away share reflects a jump in price paid per meal or more meals out. Other BLS data sets are available for analyzing shifts in prices and quantities. While price indices per food item are readily available on the BLS web site, quantity shifts must be deduced using a BLS data series known as the relative importance series. It contains the weights of items in the market basket used to derive the CPI.[18] Therefore changes in the relative importance of a given item within the CPI reflect both price and quantity changes.

Table 2.2 contains both the relative prices and the relative importance of all the food items that comprise the CPI-U for food. (I define relative price as the CPI-U for a given food type divided by the CPI-U for food overall.) As the right-most column indicates, the relative importance of meals out (or "food away from home") in the CPI increased 6.4 percent while that of food at home fell 20.4 percent. The drop in the relative importance of food at home was largely driven by the categories "Meats, poultry, fish and eggs" and "Dairy Products." For example, the quantity of "shell-eggs" (as opposed to pre-cooked eggs) consumed per person fell precipitously during this period: "shell-egg" consumption dropped from 250 eggs per capita in 1980 to 173 in 1997 (Putnam and Gerrior 1999: 139).

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[18] Relative importance values therefore sum to 100. From 1986 through 2002, relative importance data is available on the BLS archives page at: ftp://ftp.bls.gov/pub/special.requests/cpi/. The files are labeled "USRIYear.txt." Prior to 1986, the data must be requested.

Turning to the corresponding relative price shifts, compared to the price of all food, the price of meals out grew 4.8 percent while the relative price of food at home (that is, food at home relative to all food) fell 1.8 percent.[19] In summary, the changes in relative importance were driven by more than mere price shifts; they were also driven by increases in quantity demanded (Rob Cage, BLS economist, personal communication).

In addition to the shifts among broad categories (i.e. food away and food at home), which speak to demand for convenience by reference to the growth in the relative importance of meals out, the relative importance series also sheds light on the growing demand for convenience *inside* the home. That is, the same method of deduction points to an increase in quantity demanded of highly prepared food, namely cereal and frozen food, increased while the quantity demanded of less-highly prepared food, namely canned soup, fell. This is not surprising since cereal and frozen foods take less time to prepare than canned soup does. (Soup has to be stirred while it comes to a boil; frozen foods need not be watched while they cook in the microwave.) In particular, the relative importance of cereal and frozen food jumped 81.8 percent and 34.4 percent respectively. The price of cereal relative to all food jumped just 34.2 percent while that of frozen food *fell* 10.4 percent. These patterns suggest that greater quantity demanded increased the prominence of these items in the CPI (not just a rise in price). In contrast, the relative importance of canned soup increased 8.2 percent while the price jumped 18.4 percent; suggesting that the growth in relative importance of soup was driven by its price increase, not an increase in quantity demanded.

[19] Notably, price increases for "at-home food sales" were suppressed, during much of this period, by the growing competition between "conventional food retailers" and "discount supercenters and club warehouse stores," that increasingly offered a larger array of food products (Brandon 2004). The share of at-home food sales for warehouse clubs and discount supercenters rose from 1.8 percent to 11.1 percent in 1991 and 2003 respectively (Brandon 2004).

Surprisingly, the relative importance of non-alcoholic beverages fell 22.3 percent. Table 2.2 suggests that this drop reflects a 22 percent drop in their price relative to all food. However, the drop in relative importance is probably overstated because of the lag in new items being included in the CPI. That is, the values shown in Table 2.2 very likely do not include the growing demand for non-alcoholic beverages that may serve as meals, such as "Odwallas."[20] If demand for these items were included, the relative importance of non-alcoholic beverages would likely be positive rather than negative.

[20] The definition of prepared (non-alcoholic) drinks is shown in Appendix A.

Table 2.2 CPI-U and the Relative Importance of its Components, 12/80 vs. 12/00

	$CPI\text{-}U_i$ / $CPI\text{-}U_{Food}$			Relative Importance		
	1980	2000	% change	1980	2000	% change
Food (percent)*				17.32	15.22	-12.2%
Food away from home	0.96	1.01	4.8%	5.32	5.66	6.4%
Food at home	1.02	1.00	-1.8%	12.00	9.56	-20.4%
Fruits and vegetables	0.94	1.42	51.0%	1.68	1.45	-13.6%
Fresh fruits and vegetables	0.94	1.42	51.0%	0.90	1.14	25.8%
Processed fruits and vegetables	***	0.63	na	0.78	0.32	-59.1%
Cereals and Bakery products	0.97	1.12	16.1%	1.51	1.52	1.0%
Cereals and cereal products	0.97	1.05	8.1%	0.39	0.53	34.5%
flour and prepared flour mixes	1.06	0.95	-9.6%	0.10	0.07	-34.0%
cereal	0.88	1.18	34.2%	0.17	0.31	81.8%
rice, pasta, cornmeal	1.05	0.90	-14.2%	0.12	0.15	24.8%
Bakery products	0.97	1.16	19.8%	1.12	1.00	-10.8%
bread	***	***	na	0.43	0.29	-31.9%
biscuits, rolls, muffins	***	***	na	0.11	0.14	26.3%
cookies, cakes and cupcakes	0.94	1.12	19.3%	0.28	0.27	-2.5%
other bakery products (crackers, donuts)	0.95	1.14	19.6%	0.30	0.29	-2.0%
Meats, poultry, fish and eggs	1.06	0.92	-13.1%	4.05	2.57	-36.4%
Dairy products	1.05	0.96	-8.6%	1.60	1.05	-34.5%
Fresh milk and cream			na	0.92	0.41	-55.6%
Processed (butter, cheese & ice cream)			na	0.68	0.64	-5.6%
Other Food at home**	1.02	0.93	-8.9%	3.16	2.96	-6.4%
Sugar, artificial sweetner, candy, gum	1.04	0.92	-12.0%	0.51	0.36	-28.1%
Fats and oils (salad dressing, peanut butter)	1.03	0.88	-14.6%	0.33	0.29	-13.5%
Non-alcoholic beverages	1.05	0.82	-22.0%	1.32	---	---
Other prepared foods	0.96	1.03	6.6%	1.01	1.28	27.7%
canned soup	1.00	1.18	18.4%	0.10	0.11	8.2%
frozen prepared foods	0.99	0.88	-10.4%	0.16	0.22	34.4%
snacks	0.93	0.99	6%	0.19	0.27	42.3%
seasonings/condiments	0.95	1.05	10%	0.26	0.28	6.9%
misc. prepared foods, incl. baby food	***	***	***	0.30	0.42	39.7%
Non-alcoholic beverages	---	---	---	---	1.03	-22.3%

*According to the BLS (2007) "implicit quantity weights" for 1978-86, 1987-97, and 1998-2001 were derived from expenditures in 1972-73, 1982-84 and 1993-95 respectively.

**Non-alcoholic beverages became its own category (separate from "other food at home") by 2000. To create an apples-to-apples comparison of "Other Food at Home" over time, I added the non-alcoholic beverages data (1.026 in 2000) to the sum of the "Other Food at Home" data (1.934, i.e. 0.363+0.288+1.283, in 2000).

***Data not available before 1997.

Source of CPI data: http://www.bls.gov/cpi/data.htm.

Source of 1980 relative importance data: Faxed upon request from BLS economists.

Source of 2000 relative importance data: Author's compilation of archived BLS data. Available at: ftp://ftp.bls.gov/pub/special.requests/cpi (link:"usri2000.txt").

As an aside, the causal relationship (between the price and implied quantity shifts) described above is disputed. One scenario is: The growing demand for convenience in meals likely prompted the aggregate supply curve (of all prepared foods) to shift to the right. That is, growing demand likely *induced* the food industry to supply new and improved convenient meal options. In 2000, consumers had more choices in the freezer and prepared aisles than they did in 1980; similarly, the number of fast food restaurants ballooned. In the other scenario, causation runs the other way. Jekanowski et al. (2001) find that the growth in the number of fast food restaurants was a driving force.

Regardless of the causation, both the demand for and the availability of convenient meal options increased. While the effect on food prices is theoretically indeterminate, as the two could theoretically cancel each other out, most prepared food prices fell relative to that of all food.[21]

USDA economist Variyam (2005) explains the drop in the price of frozen food (relative to other foods consumed at home) by reference to technological advances: through better production technologies, more and better goods are produced, thereby driving prices down. Moreover, food scientist Kashtock (1988) explains that such advances have led to the availability of lighter-weight and unbreakable packaging materials; the use of these materials reduce shipping costs. These savings may have been passed on to consumers, generating more demand for convenient meal options.[22]

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[21] The key exception is fresh fruits and vegetables, which were increasingly packaged as ready to eat. (Consider the growing availability of pre-sliced apples.) However, a separate literature suggests that the jump in relative price of those goods is overstated due to limitations of the method used to construct the CPI for those items (MacDonald 1995).

[22] Even if the savings were not passed on, demand for prepared food certainly increased as a result of the growing relative price of meals out; assuming that frozen meals are a substitute for

In summary, a "micro-macro link" underlies the rising demand for convenience. That is, the household level shifts (in both size and number of paid workers) that likely increased demand for convenient meals were mediated by concomitant shifts in the food industry (in terms of technological advances and variety of restaurant options available). Micro-level survey data on household expenditures, such as that presented below, does not, by definition, include the macro-level channels described above. As mentioned at the outset, I proxy the macro-level channels by incorporating two price ratios: the price of food to that of all items and the price of food away to that of food at home.

2.4 Data, Sample Selection and Summary Statistics

The diary segment of the Consumer Expenditure Survey, collected by the Census Bureau (under contract with the Bureau of Labor Statistics (BLS)), is designed to capture expenditure data for small, frequently purchased items such as food, beverages, food consumed away from home, gasoline, housekeeping supplies, nonprescription drugs and medical supplies, and personal care products and services. Diaries are completed for items purchased each day by the sample consumer units (CUs) for two consecutive one-week periods; the idea is that respondents write down their purchases before they forget how much they spent on them. In contrast, each consumer unit in the *other segment* of the survey (the interview segment) is interviewed once every 3 months; small purchases would likely be forgotten over such a relatively long span of time.

The diary portion of the Consumer Expenditure Survey has two quirks. First, the BLS expanded some food variables in to two variables in some cases. Appendix A lists

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meals out, the 4.8 percent jump in the ratio of the price of food away to that of all food would have made frozen food more appealing than meals out.

the contents of all food variables, and boxes indicate when a given food variable was split in to two variables. Second, each segment of survey, namely the diary segment and the interview segment, has its own questionnaire and independent sample. Although the interview survey does include total expenditures, the diary data does not do so. Therefore, I use family income (before taxes) rather than total expenditures, when referring to "total expenditures." Using household income as a proxy for expenditures likely yields an upward bias in my measure of the elasticity of demand for convenience in meal production; average annual expenditure amounted to 90 percent of before-tax household income in both years under consideration (1980 and 2000).

The samples are restricted as follows. Only households (or CUs) where household heads are between the ages of 20 and 60 inclusive and are coded as "complete income reporters" are included. I exclude households with over 7 members. I also exclude outliers, including households with annual household income under $0 and those with zero unprocessed and/or prepared food expenditures. Finally, I have defined the food variables so that they exclude alcohol and variables linked to food bought while on trips, catered affairs, board or snacks bought in vending machines.

As shown in Table 2.3, both the number of children and the number of adults per household fell between 1980 and 2000. On average, real weekly household income, as well as the age and paid work hours of the woman head of household (or wife, if married) increased. All of these changes were statistically significant. Turning to the proportions shown in Table 2.3, the percentage of households with one or more children fell by 7 percent; the percentage of households with three or more children fell by twice that amount (14 percent). The percentage of households with a young child (age zero to five)

fell by just 7 percent; the percentage of households with school-aged children fell by 11 percent. All of the changes in Table 2.3 are statistically significant except for the drop in the percentage of households with a young child and the drop in the homeowner share.

Table 2.3 Selected Sample Means and Proportions

	1980	2000	|t value|	% change
Household size	3.4	3.2	4.5	-5%
Number of persons under 18	1.2	1.2	3.0	-7%
Number of adults	2.2	2.1	3.8	-3%
Real weekly household income (2000 $)	926.0	1,190.1	14.4	29%
Age of female head (or wife, if married)	37.2	40.0	10.0	8%
Paid weekly work hours of female head (or wife, if married)	25.6	30.4	10.2	19%
Household Type				
Households without children (per cent)	34.8	39.2	3.5	13%
Households with 1 or more children (per cent)	65.2	60.8	3.5	-7%
Households with 2 or more children (per cent)	39.3	36.8	2.0	-6%
Households with 3 or more children (per cent)	15.3	13.2	2.3	-14%
Households with a child age 0 - 5 (per cent)	27.5	25.7	1.2	-7%
Households with a child age 6 -15 (per cent)	43.4	38.8	3.2	-11%
Households with a child age 16 - 17 (per cent)	13.4	12.0	2.0	-11%
Homeowners (per cent)	0.7	0.7	0.6	-1%
Number of households in sample	2,210	4,051		
Note: Sample includes only those households with:				
1.) age of household head is 20 - 60 years;				
2.) positive expenditure on both prepared food and unprocessed food;				
3.) positive before-tax annual household income; and				
4.) household size is 7 or less.				
Source: Author's calculation based on the diary portion of the 1980 and 2000				
Consumer Expenditure Surveys.				

2.5 Model Specification

A basic "Working-Leser model" relates household food expenditure to household income as follows:

$$w_{ij} = \beta_0 + \beta_1(\ln(x_i)) + \varepsilon_{ij} \quad (2.1)$$

where w_{ij} is the budget share of the jth good for household i; x_i is household income and the unobservable is ε_{ij}[23]

Researchers define the dependent variable, "budget share," in different ways, including: food as a share of all income (Pollak and Wales 1992); food as a share of all expenditure (Richards, Gao and Patterson 1998; Van Driel, Nadall and Zeelenberg 1997; Rubin, Riney and Molina 1990; Tyrell and Mount 1987); food as a share of *a subset of* all expenditures (Nicol and Nakamura 1994); food away from home as a share of all food (Horton and Campbell 1991); a given type of food for use at home as a share of all food at home (Kokoski 1986); a given type of food for use at home as a share of a given subset of food at home (Senauer, Sahn and Alderman 1986); and a given type of food relative to another type of food (Crossley and Lu 2004).

The Working-Leser model that I employ is similar to that used by Senauer, Sahn and Alderman (1986). Like Senauer and his colleagues, I compare demand for foods that vary by degree of convenience; while their dependent variables are quantities (of rice and bread), I use shares of the food budget allocated to each of three goods: unprocessed foods, prepared foods and food away. In other words, I use the following three food shares as dependent variables in the regression analysis: (unprocessed food expenditures /

[23] Specifying income in natural logarithms "account[s] for decreasing rates of increase in food consumption" (West and Price 1976: 727). The unobservable is assumed to satisfy $E(\varepsilon_{ij} \mid x_i) = 0$. (Blundell, Duncan and Pendakur 1998).

all food expenditures); (prepared food expenditures / all food expenditures) and (food away expenditures / all food expenditures).

Turning to the independent variables, I add relative prices variables to the cross-sectional Working-Leser framework, as do Bunkers and Cochrane (1957), Kokoski (1986), Lanjouw and Ravallion (1995) and Sanchis-Llopis (2001).[24] Although Kokoski (1986) shows that shifts in relative food prices over time play an important role in demand for food, cross-sectional analyses generally do not control for such shifts.[25]

To the extent that I am interested in the impact of children on the income elasticity of demand for food, I allow children to "enter" the empirical specification in two ways: whether any children are present (Model 1) and how many children are present (Model 2). In both models, the omitted category is households with no children. Model 1 takes the following form:

$$w_{ij} = \beta_0 + \beta_1(\ln(x_i)) + \beta_2(child_i) + \beta_3(\ln(x_i)* child_i) + \beta_4(other_i) + \varepsilon_{ij} \qquad (2.2)$$

where w_{ij} is the budget share of the jth good for household i; x_i is household income; $child_i$ is a dummy variable for children present and $\ln(x_i) * child_i$ is an interaction term. The term $other_i$ includes: number of adults; woman's weekly paid work hours; woman's

[24] In their study of food expenditure, Bunkers and Cochrane (1957) also include two price ratios: 1.) an index of farm prices divided by the index of prices other than farm prices and 2.) an index of farm food *product* prices divided by an index of nonfarm food *service* prices. In his study of clothing expenditure, Sanchis-Llopis (2001) includes the log of the ratio of the price index of clothing to the price index of other goods.

[25] Jorgenson (1997) identifies "two distinct lines of empirical research on consumer behavior." One line models the *representative consumer* using *time series data* on prices, per capita quantities consumed and total expenditure. The other models the *individual consumer*, using *cross sectional* data on quantities consumed, total expenditure and characteristics of the household. Some researchers combine time-series and cross-section datasets (including Benus, Kmenta and Shapiro 1976; Jorgenson and Slesnick 1987; Bryant and Wang 1990; Anderson and Vahid 1997). Typically, when the price of food and the price of non-food enter the model separately, researchers find that per capita food consumption is inversely related to food prices and directly related to non-food prices.

age; married dummy; homeownership dummy; relative price of food away and food at home; relative price of food and all items less food; an Inverse Mills Ratio.[26] The. Model 2 takes the following form:

$$w_{ij} = \beta_0 + \beta_1(\ln(x_i)) + \beta_2 (child1_i) + \beta_3(child2_i) + \beta_4 (child3_i)$$

$$+ \beta_5(\ln(x_i)* child1_i) + \beta_6(\ln(x_i) * child2_i) + \beta_7(\ln(x_i)* child3_i) + \beta_8(other_i) + \varepsilon_{ij} \quad (2.3)$$

where w_{ij} is the budget share of the jth good for household i; x_i is household income; $child1_i$, $child2_i$ and $child3_i$ are dummy variable for households with one, two and three or more children respectively; $\ln(x_i)* child1_i$, $\ln(x_i) * child2_i$ and $\ln(x_i) * child3_i$ are interaction terms. The variables included in "other" are listed above.

2.6 Empirical results: Does income elasticity depend on household composition?

The two primary results of this study come from the interaction terms; they indicate that demand for convenient meal options depends on household composition; moreover, the relationship between demand for convenience, household income and composition changed over time. Tables 2.4 and 2.5 contain the results for 1980 and 2000 respectively.

Overall, the main effects shown in Tables 2.4 and 2.5 are consistent with those found in the literature on demand for convenient meals, with two exceptions. First, for all three food share types (and for both specifications of each food share model), the coefficient on women's paid work hours is zero. Second, the main effect for children

[26] An Inverse Mills Ratio enters only the food away model, since food away is the only dependent variable that contains zero values. This ratio is generated from the equation predicting that a household buys at least one meal out. According to Heckman (1980), inclusion of this ratio eliminates the potential sample selection bias in cross-sectional wage equations; it is also included in cross-sectional expenditure equations (Park, Holcomb, Curry-Raper, and Capps 1996).

switches in the food away model. It is not statistically different from zero in 1980; however it is negative, and statistically significant in 2000. I would have expected it to be negative in both years; households with children generally eat out less because they forego the scale economies associated with eating in.

As expected, the presence of children increases the prepared food share. The coefficients on the child(ren) present dummy are positive in both years. Also, the presence of three or more children drives food shares in expected ways; in both years, the presence of three or more children in a household *reduces* the food away share and *increases* the prepared food share. All of these results were statistically significant at the one percent level.

Like Byrne, Capps and Saha (1996), I find that for food away, the interaction term of interest switches signs over this period. Looking from 1982-1989, Byrne et al. found that this term was negative and statistically significant in 1982, not different from zero in 1983-85 and positive and statistically significant in 1986-1989. For me, the income/child(ren) present interaction term switches from negative (though statistically insignificant) in 1980 to positive and statistically significant in 2000. This switch in the effect of children on the income elasticity of demand for meals out is consistent with the growing number of kid-friendly restaurants, including fast food chains with jungle gyms and cafeteria-style restaurants, a factor that is not controlled for in the regression estimation framework below.

In contrast, the interaction term remains negative over time in the prepared food model. (The coefficient on the income/child(ren) present term is -0.02, and statistically significant, in both years.) Parsing by child count, however, I find that prepared food

became negative for one and three-child households. (For one-child households, for example, the relevant interaction term is not statistically different from zero in 1980. By 2000, it is negative and statistically significant.) This result is consistent with the idea that (most) households with kids increasingly opted for meals out (rather than prepared food), likely because of the growing number of kid-friendly restaurants.

Table 2.4 Coefficient Estimates by Food Type in 1980 (Weighted Least Squares)

	unprocessed		prepared		away	
	Mod. 1	Mod. 2	Mod. 1	Mod. 2	Mod. 1	Mod. 2
Intercept	2.68**	2.54**	-0.05	-0.22	-1.49**	-1.23**
LN (real weekly hh income)	-0.02**	-0.02**	-0.00	-0.00	0.03**	0.03**
Dummy: child(ren) present	-0.09		0.11**		0.02	
Dummy: 1 child present		-0.59**		0.10*		0.51**
Dummy: 2 children present		-0.05		-0.04		0.11
Dummy: 3+ children present		0.08		0.27**		-0.26**
Number of adults	-0.02	-0.01	0.01**	0.02**	0.01	0.00
Woman's weekly paid work hours	-0.00**	-0.00**	-0.00**	-0.00**	0.00**	0.00**
Woman's age	0.00**	0.00**	-0.00**	-0.00**	-0.00	0.00
Married dummy	-0.04**	-0.03**	-0.03**	-0.03**	0.08**	0.07**
Homeowner	0.05**	0.03	-0.02*	-0.02*	-0.03	-0.02
Price ratios:						
price of food / price of all items	-0.69*	-0.72*	0.57**	0.57**	0.11	0.14
price of food away / price of food at home	-1.59*	-1.36*	-0.26	-0.08	1.55*	1.19
Interaction terms:						
LN (real wkly hh income) * child(ren) present	0.02*		-0.02**		-0.01	
LN (real wkly hh income) * one child		0.10**		-0.02		-0.09**
LN (real wkly hh income) * two children		0.010		0.01		-0.03*
LN (real wkly hh income) * three+ children		0.00		-0.04**		0.03*
Inverse Mills Ratio					-0.27	-0.09
Note: ** and * indicate statistical significance at the 1 and 5 percent levels, respectively.						

Table 2.5 Coefficient Estimates by Food Type in 2000 (Weighted Least Squares)

	unprocessed		prepared		away	
	Mod. 1	Mod. 2	Mod. 1	Mod. 2	Mod. 1	Mod. 2
Intercept	1.96**	1.88**	0.06	0.051	-1.09**	-1.04**
LN (real weekly hh income)	0.00	0.00	-0.01*	-0.01*	0.03**	0.03**
Dummy: child(ren) present	-0.00		0.14**		-0.20**	
Dummy: 1 child present		0.01		0.09**		-0.24**
Dummy: 2 children present		0.17**		-0.064		-0.070
Dummy: 3+ children present		-0.24**		0.52**		-0.28**
Number of adults	0.00	0.00	-0.01	-0.006	0.01	0.01
Woman's weekly paid work hours	0.00**	0.00**	-0.00*	-0.00	-0.00**	-0.00**
Woman's age	-0.00**	-0.00**	0.00	0.001	0.00**	0.00**
Married dummy	-0.01	-0.01	-0.00	-0.02**	0.03**	0.04**
Homeowner	0.14**	0.13**	0.01	0.014	-0.14**	-0.14**
Price ratios:						
price of food / price of all items	-1.63**	-1.58**	0.20	0.200	1.48**	1.45**
price of food away / price of food at home	-0.36**	-0.31**	0.12	0.120	0.04	0.01
Interaction terms:						
LN (real wkly hh income) * child(ren) present	0.01		-0.02**		0.02**	
LN (real wkly hh income) * one child		0.01		-0.02**		0.03**
LN (real wkly hh income) * two children		-0.02		0.011		0.00
LN (real wkly hh income) * three+ children		0.05**		-0.08**		0.03*
Inverse Mills Ratio					-1.17**	-1.13**
Note: ** and * indicate statistical significance at the 1 and 5 percent levels, respectively.						

As opposed to the marginal effects described above, income elasticities evaluated at the mean of the dependent variable allow foods to be categorized as "normal" or "inferior."[27] Table 2.6 shows that unprocessed food shifted from an inferior to a normal good for both households with and without children; the sign on household income switched from negative to positive. Turning to prepared food, the two groups had the same income elasticity of demand for prepared food in 1980; prepared food was an inferior good for both groups. Prepared food became more inferior for both groups, though more so for households without children. Finally, the income elasticity of demand for food away indicate that it remained a normal good for both households with and without children. These results suggest that an increase in income is spent on meals away, not prepared food.

Table 2.6 Income Elasticities of Demand by Food Type, 1980 and 2000

Households without children	**1980**	**2000**
unprocessed	-0.045	0.004
prepared	-0.006	-0.045
away	0.094	0.097
Households with children		
unprocessed	-0.043	0.004
prepared	-0.006	-0.040
away	0.111	0.107

2.7 Conclusion

What is the predicted impact of children on the income elasticity of demand for convenient meal options? On one hand, children might *increase* the income elasticity of demand for both meals out and prepared food because parents considering cooking at

[27] For the linear log model above, the elasticity formula is: β_I/average w_j, where w_j is the food budget share for the jth good (i.e. unprepared, prepared or food away).

home have a particularly high-value alternative use of time; by cooking, parents have to forego spending time interacting with their children (Kimmel and Connelly 2007). On the other hand, children might *decrease* the income elasticity of demand for convenient meals for several reasons; one reason is that the potential to harness economies of scale from meals in increases with each additional person; each subsequent child (or adult) should theoretically reduce the likelihood of eating out.

The main contribution of this essay is to uncover this interaction term in the context of prepared food separately from that for food away. I show that the interaction in the food away model switches from zero to positive over time, indicating that parents increasingly bought time with their kids by outsourcing meal preparation/clean-up. This was partly facilitated by a fall in the price of food relative to all non-food items. In contrast, the child/household income-interaction term in the prepared food model was negative in both years, indicating that prepared food remained an inferior good in households with children.

CHAPTER 3

SCALE ECONOMIES IN MEAL PROVISIONING IN THE U.S., 1980-2000

3.1 Introduction

Economies of scale in household production have important implications for living standards. This idea is captured by an old adage: "Two can live as cheaply as one." This adage conjures the notion of cost savings that arise from sharing within households. Relative to one person living alone, two people can both share the cost of "public" goods (such as appliances) and pool their labor. Pooling labor is especially relevant in the context of scale economies from meal preparation: cooking for two is not twice as time-consuming as cooking for one. Similarly, cooking for three is not three times as time-consuming as cooking for one. In other words, larger households benefit from savings (of money and time) to a greater extent that small ones do since the marginal cost of each extra person is smaller than that for the first person.

The ability to enjoy cost savings from these sources, however, hinges on several factors, such as household size, the level of household technology, the availability of substitutes for home-produced goods and services, and the gender division of labor. Each of these factors changed drastically during the 1980s and 1990s: Americans increasingly live in households containing fewer members, rely more on consumer durables such as microwave ovens, and purchase more prepared foods for use at home and meals at restaurants. Moreover, the share of women who work for pay has increased, and along with it the opportunity cost of their time spent cooking; not surprisingly, the amount of time they spend cooking fell over this period; more men devote time to meal preparation, but time use studies (of married couples) generally conclude that their contribution only

partially offsets the drop in women's time spent on food preparation. In light of these changes, it seems likely that scale economies harnessed by households changed during this period.

Economists and others who study economic well-being should incorporate changing scale economies within their measures of changing living standards.[28] Household income is often used to compare living standards over time; however, this measure of living standards is blind to changes in scale economies from household production. To see this, suppose that real incomes remain constant but economies of scale increase over a given period. To the extent that economies of scale "free up" household resources (including time and/or money), an increase in scale economies improves families' living standards overall and in relation to one or two person households. Similarly, if scale economies fall, families' living standards fall overall and in relation to one or two person households.

In this essay, my research question is: Did greater reliance on prepared foods and other "food away" (including meals purchased in restaurants or fast food, carryout and home delivery) reduce economies of scale from meal preparation? Or did technological advances in the production and distribution of food mediate against a loss of scale economies in households? Economists do not agree on a single best way to answer this research question. Using diary portion of the Consumer Expenditure Survey, I estimate two Engel models for each of two years (1980 and 2000). I find that scale economies in meal preparation fell; my lower and upper bound estimates of the drop are 43 percent and 110 percent respectively.

[28] The terms "economies of scale" and "scale economies" are used interchangeably in this essay.

The essay is organized as follows. Section 3.2 provides the intuition behind the notion of scale economies from household production. Section 3.3 contains a review of the literature on how economies of scale in household production arise and are measured empirically. Section 3.4 contains a description of the data employed, the sample used and descriptive statistics. Section 3.5 covers the empirical results associated with three Engel Curve Analyses; these analyses, in turn, reflect two different ways that scale is framed conceptually. Section 3.6 summarizes the main conclusion: five of the six models indicate that scale fell during this time frame.

3.2 Theory: Household Production of Meals and Economies of Scale

Economies of scale (or "scale economies") arise when fixed costs of production are spread over a larger output. A wide range of production processes yield scale economies; in all cases, the cost structure is such that fixed costs of production are high and incremental costs are small or zero. That is, the first unit is expensive to produce and all additional copies cost almost nothing. Once a CD has been produced, for example, the cost of producing an additional one is close to zero. As a result, the more one produces, the lower her average cost of production.[29]

Shapiro and Varian unpack this result by distinguishing between the fixed and variable costs of producing information. The fixed costs of producing information are known as "sunk costs," i.e. costs that are not recoverable if production is halted. Sunk costs are paid up front, before production begins: "If you invest in a new office building

[29] Theoretically, diseconomies of scale could occur beyond a critical output level for some items. The standard example is the scale economies in production is typesetting costs spread over an increased "print-run." In this case, a point would be reached where a new machine would be needed, which would increase the average total cost of production (Gold 1981).

and you decide you don't need it, you can recover part of your costs by selling the building. But if your film flops, there isn't much of a resale market for its script" (Shapiro and Varian 1999: 22).

The time investment associated with grocery shopping is analogous to the time investment associated with writing a script that flops: there is no resale market for one's groceries if they aren't used. Groceries that aren't used simply go to waste and the time that was spent getting them is not recoverable: it's a sunk cost of meal production. In addition to the sunk (time) cost of grocery shopping, household meal provisioning entails fixed costs, including the time spent preparing meals, cleaning up after meals and, to a lesser extent, maintaining capital equipment (e.g. cleaning out the oven and refrigerator).

Economies of scale in household meal production occur when the fixed costs are spread over several people. That is, the first meal is expensive to produce (since the fixed costs must be paid); however, the per-person cost of each subsequent meal falls as the number of meals served is increased (McCracken and Brandt 1987). In other words, economies of scale arise in meals produced at home because the marginal cost of a meal at home is lower than the average cost of the meal (where households contain more than one person). In contrast, economies of scale do not arise for meals out because the marginal cost equals the average cost.

To see this, consider the following example. If 3 people eat out for $10 each, the marginal cost (i.e. the cost per person) is $10 and the average cost is $30/3 people = $10. If they had eaten at home, the initial cost (for person 1) might have been $10 but the subsequent costs (for each of the two other people) might have been $3 each. In this case the marginal cost is $3 while the average cost is $16/3 people = $5.3. That is, the

marginal cost of eating in ($3) is less than the *average* cost of eating in ($5.3). In summary, economies of scale reduce the marginal cost relative to the average cost of that same good. For Crossley and Lu (2004) food at home is a *public* good because there are returns to scale in food preparation; food *away* is a private good because this is not the case.[30]

3.3 Literature Review

Scale economies are difficult to measure directly (econometrically). Moreover, neither consumer demand theory nor household production theory provides direction on this front; that is, neither theoretical framework necessitates a particular specification for empirical studies of scale parameters in particular or of time and/or budget allocations more generally (Michael 1972). Moreover, empirical estimation of a production function for meals is difficult because both inputs and outputs are typically measured in dollar terms, rather than in physical output. In the case of household production, empirical estimation is further complicated by the fact that a significant input (unpaid labor) is un-priced, as is one of the significant outputs (the value of home-produced meals).

3.3.1 How economies of scale arise in the household production of meals

Economies of scale in the household production of meals arise through three channels: market-purchased ingredients, time devoted to meal preparation/clean-up and household public goods (i.e. kitchen appliances, flatware, etc.). These channels are

[30] This is not a universally-chosen approach. Nelson's (1988) definition of economies of scale differs; for her scale economies can arise from both private goods and public goods. In her model of economies of scale in household production, "increased household size is associated with increased economies … of scale in private goods."

summarized in Table 3.1. Scale from market purchased ingredients is admittedly conjectural; larger households *could* waste food or *not* buy in bulk. The time devoted to household production yields scale if most of the time cost is fixed, rather than variable; scale comes from spreading a large fixed cost over all household members. Finally, public goods yield scale by definition.

Table 3.1 Overview: Scale economies in the household production of meals

Channel	Brief description
Market-purchased ingredients	not wasting food, buying in bulk
Time devoted to household production	distributing the fixed costs of shopping, cooking and cleaning
Public goods	distributing the fixed costs of maintaining consumer durables

The scope for harnessing economies of scale from each channel changes over time, as described in the remainder of this section.

3.3.1.1 Market-purchased ingredients

Larger families may buy in bulk, saving money per unit by wasting a relatively small share of their groceries. Consider the product labels "family size" and "value size." Consumers understand that these two labels mean the same thing: larger families can "stretch the dollar" or create "value" by buying in bulk. Larger families may also lead to less waste: a single person might buy a loaf of bread and throw out the last half of it after the bread goes stale, while a family of two would consume the entire loaf (Vernon 2005). In this case, the word "scale" in the phrase "economies of scale" is interpreted literally; the phrase is used synonymously with the phrase "economies of size."

The scope for harnessing economies of scale from market-purchased goods (or from time devoted to household production) hinges on household composition. To see

this, consider economies of scale that may arise for a given household size of two different compositions: a household of two adults and two teenagers requires more food than a household of two adults and two young children. Household composition affects both market purchases and time allocation, due to different preferences/needs of adults and children. If everyone can eat the same meal, then the household is especially likely to benefit from economies of scale. If instead, separate meals are required for individuals, economies of scale are reduced or lost entirely.

During the period in question, households that opted for prepared foods in particular benefited from technological advances (both in the packaging and manufacture of these foods) that helped stretch their food budgets by, for example, keeping food fresh longer.

3.3.1.1.1 Packaging of prepared food

The food science literature points to technological advances in the packaging of food that both reduced the cost of production and/or distribution and increased foods' freezer/shelf lives. As an example of the former, Kashtock (1988) describes food producers' growing use of lighter-weight and unbreakable packaging materials that reduce shipping costs; "[t]he extremely successful 1983 market introduction of Heinz' catsup in a squeezable blow molded barrier bottle led the movement in this direction." Assuming that producers pass savings on to consumers, this change would have made prepared food more affordable, thereby encouraging cooking at home.

As an example of the latter, Kashtock points to "aseptic packaging," a technology where the product and the packaging are sterilized separately, extending shelf life of refrigerated products that were increasingly packaged this way, including pasta salads, entrees and full dinners. Aseptic packaging technology has also facilitated the

emergence of an array of "retorted" products: "Convenience in the aseptic product category is offered by products such as snack puddings and dips in 'EZ open' thermoformed containers, and the familiar single serving juices in brick-style containers with the punch- through attached straw; instant snacks and lunchbox items for busy parents to serve." By encouraging consumers to eat in rather than out, these advances would contribute to scale economies.

3.3.1.1.2 Manufacture of prepared food

The Institute of Food Technologists (2000) points to new products that sped up home meal production, which came on the market as a result of new technologies: "When we look at the technologies that assisted in putting these new products on the market…, we find: …Cup-a-Soup (dehydration technologies), Stove Top Stuffing (water activity developments), Hamburger Helper (dehydration techniques), and Soup Starter (dehydration techniques). The technology inputs met consumer needs for convenience" (IFT 2000: 71).

Technological advances in the *manufacture* of prepared food enhanced its appeal to consumers. For example, "advances in polyethylene plastics and other materials have improved control over the internal moisture of food packages, thus extending the freezer/shelf life of many foods and improving flavor" (Cutler, Glaeser and Shapiro 2003: 105). Moreover, the food industry has increasingly made use of chemists as flavor specialists: "These chemists hone in on what makes certain foods desirable and synthesize it in the laboratory. These artificial flavors can then be added to make pre-prepared food more appealing" (Cutler, Glaeser and Shapiro 2003: 105). By extending freezer/shelf life and by improving the quality (and therefore desirability) of prepared

foods, these advances increased the scope that couples had to harness economies of scale; they encourage consumers to eat in rather than out.

3.3.1.2 Time devoted to household production

Time devoted to household production yields economies of scale through three channels: through the production process itself, through specialization/division of labor and through complementarity in production processes (Jacobsen 1994).

3.3.1.2.1 Production process

Relative to a single person, a family benefits from "production process economies of scale." For example, it doesn't take twice as long to boil two potatoes as one (Vernon 2004).

During the period in question, meal production time fell with the advent of the microwave oven. The BLS (2001) estimates that about 12 to 13 percent of U.S. households owned a microwave oven in 1978. That number jumped to 25 percent by 1986 and over 90 percent by 2000.[31] Proshaska and Shrimper (1973) predicted that microwaves would reduce the "opportunity cost component of the full price of eating at home." (They define the "full price" as the sum of the price of food and the time needed to convert it in to meals.) To the extent that microwave ovens made it more efficient to prepare meals at home, this technology increased the scope couples had to harness economies of scale.

3.3.1.2.2 Specialization/division of labor

Household chores have traditionally been divided, with women taking primary responsibility for cooking. However, time use data indicate that this division of labor

[31] Kashtock (1988) estimates that "[the microwave oven] is currently in use in about 55 percent of US households, with this figure expected to rise to 80 percent by 1990."

has weakened slightly. Husbands increasingly viewed meal preparation as a shared responsibility during this period: the ratio of wives' time spent cooking meals to husbands' time spent cooking meals fell from 8.8 to 3.8 in 1975 and 1995 respectively. A similar trend occurred in meal clean up; the corresponding values for meal clean-up are 10 and 5.2 (Bianchi et al. 2000). If wives were more efficient, the cost of home produced meals may have increased; if husbands were more efficient, it may have fallen.

3.3.1.2.3 Complementarity in the production process

Households of all sizes have experienced efficiency gains in the "production process" due to the rise of superstores. The number of stores classified as "superstores" increased from about 3,200 in 1980 to more than 6,500 in 1994. The average square footage of grocery sales space per store increased from about 23,000 to around 35,000 (Jekanowski and Binkley 2000). Messinger and Narasimham (1997) argue that this is not an effort to lower costs (through scale economies) but a method to increase consumer convenience and provide "one-stop shopping."[32] The time savings associated with one-stop shopping represent an efficiency gain.

3.3.1.3 Household public goods

By definition, a multi-person household has lower per capita capital costs; they implicitly share the cost of running and maintaining appliances (Jacobsen 1994). Also, conviviality among family members, a non-pecuniary public good, may induce them to eat in more, relative to single people.

[32] As the number of stores classified as superstores increased, the *overall* number of stores fell from about 26,800 in 1980 to 24,500 in 1994. This pattern could be interpreted as simply increasing store size to harness economies of scale.

3.3.2 Relative Importance of Scale Economies from Time Inputs vs. Meal Ingredients

Of the channels described above, which is the most powerful? Vernon (2004) combines Russian time use and expenditure data (for the period 1994-98) and compares the relative importance of the two tractable meal inputs in question: time and ingredients.[33] She finds that the scale economies from food preparation time are twice those from food expenditure. Specifically, in households with two or more people, doubling the size of the household (holding wages and non-labor income constant) (1) decreases per capita food expenditures by 31 to 32 percent and (2) decreases per capita food preparation time by 74 to 77 percent.

The growing demand for convenience in meal production *inside the home* appears in American time use data for the period considered here. Hamermesh (2007), for example, finds that the amount of time that married couples spent in the kitchen fell between 1985 and 2003. Specifically, the amount of time spent by wives and husbands producing meals (grocery shopping, cooking and cleaning up) dropped 31 and 20 percent, respectively.[34]

In conclusion, if time inputs yield greater economies of scale than food expenditure, as Vernon's analysis suggests, then the results below constitute lower-bound estimates of drop in scale economies from 1980 to 2000; they represent food expenses, not time spent preparing food.

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[33] Other studies that separately model economies of scale arising from market goods and from time used in meal production include: Prochaska and Schrimper (1973) and Johnson and Pencavel (1980).

[34] His study is based on the Time Use Survey, a precursor to the larger American Time Use Survey.

3.4 Data, Sample and Descriptive Statistics

Total food expenditure data is available in both the interview and diary segments of the Consumer Expenditure Survey. These segments are based on responses from separate samples. Like the previous chapter, this one employs the diary survey. This choice biases average food away expenditure downward; although the diary segment is designed to capture expenditures data for frequently-purchased items such as food away, it tends to have a slightly higher fraction of consumer units with zero spending on food away than the interview segment, and correspondingly a lower aggregate expenditure (Bee, Meyer and Sullivan 2012). Bee and his coauthors trace aggregate consumer expenditure in the two segments in 1986 and 2010; they find that food away expenditures in the diary survey were 85 percent of those in the interview survey in 1986 and just 76 percent by 2010.[35]

The samples are restricted as follows. Only households (or CUs) where household heads are between the ages of 20 and 60 inclusive and are coded as "complete income reporters" are included. I exclude households with over 7 members. I also exclude outliers, including households with annual household income under $0 and those with food expenditure equal to $0. Finally, I have defined the food variables so that they exclude alcohol and variables linked to food bought while on trips, catered affairs, board or snacks bought in vending machines.

As shown in Table 3.2, the share of total income devoted to food remained the same for households with and without children, households with children spent a

[35] In Table 2 of their article, Bee and his colleagues report aggregate expenditure on food and non-alcoholic beverages in millions of dollars. In 1986, for example, this variable was 184,751 and 217,242 in the diary and interview surveys respectively. The former divided by the latter yields the 85 percent stated above.

slightly higher share than their childless counterparts in both years. What is surprising in Table 3.2 is the divergence in per capita weekly food expenditure. For households without children it remained unchanged in real terms; for parents it fell by a statistically significant amount.

Table 3.2 Selected Sample Means

	1980	2000	|t value|	Percent Change
Households without children				
Food share of household income	0.14	0.15	1.27	5%
Per capita weekly food expenditure	61.9	61.1	0.52	-1%
Per capita weekly household income	433.4	595.7	10.73	37%
Households with children				
Food share of household income	0.17	0.17	0.02	0%
Per capita weekly food expenditure	38.3	35.8	3.54	-6%
Per capita weekly household income	242.4	320.9	12.33	32%
Source: Author's calculation based on the diary portion of the 1980 and 2000 Consumer Expenditure Surveys.				

Scale economies in households are present if per person expenditure on food falls as the household size increases. Chart 3.1 suggests that scale associated with "doubling up" was larger in 2000 than in 1980. (The drop in real weekly per capita food expenditure was 21 percent in 1980 but 27 percent in 2000.) However, looking only at households with children (in Chart 3.2), the trend reverses. The drop associated with the *third* person became smaller; economies of scale appear to have fallen. Together, these charts suggest that scale trends hinge on the marginal cost of a child versus that of an adult.

Chart 3.1 Percent Drop in Per Capita Food Expenditure by Household Size, 1980 and 2000

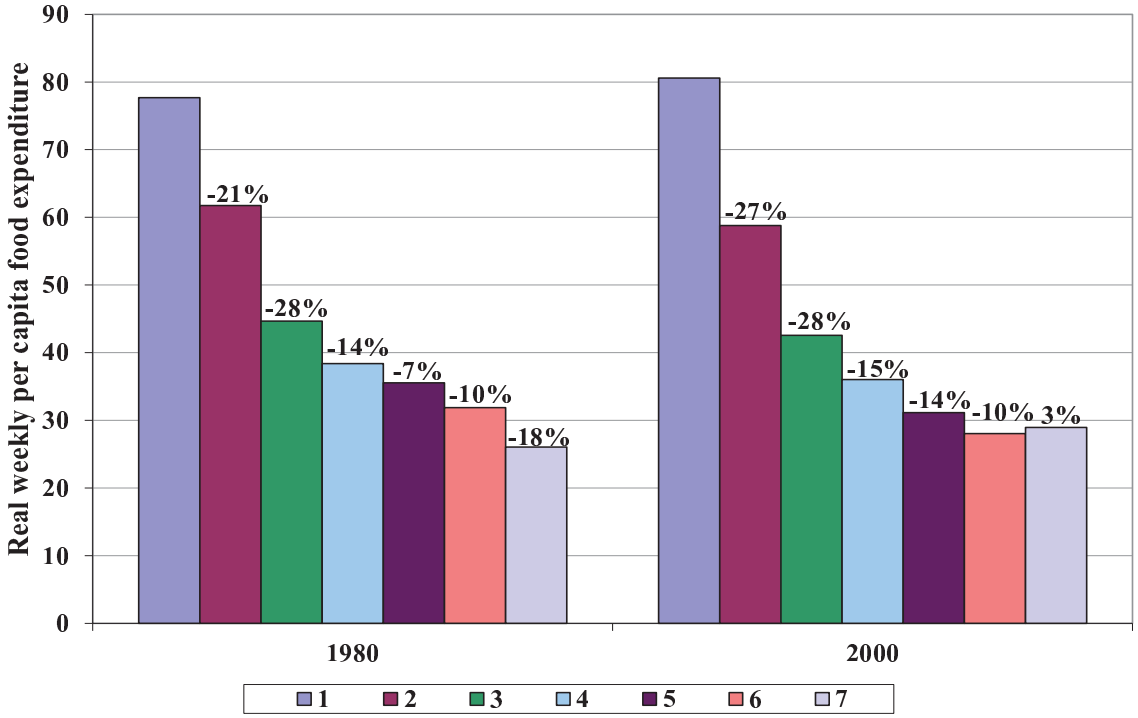
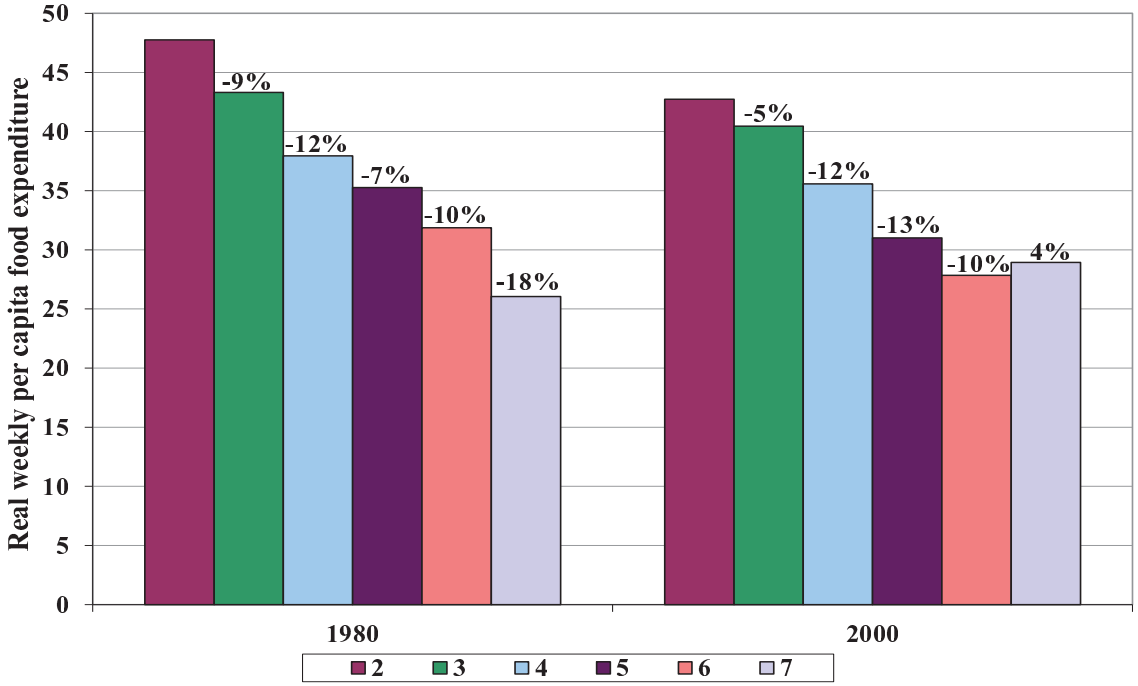


Chart 3.2 Percent Drop in Per Capita Food Expenditure by Household Size (Households with Children Only), 1980 and 2000



3.5 Engel Curve Analysis

An Engel curve is a function that describes the relationship between a consumer's expenditures on a good or service and her total resources, holding prices constant (Brown and Deaton 1972). Authors use a variety of control variables, when isolating the household income-expenditure (and/or household size-expenditure) relationship, such as age of the household head and the geographic region of the household. That is, a general form of the Engel curve is

$$E_i = f_i(Y, H, A, R) \tag{3.1}$$

where E_i is the households expenditure on the market good i, Y is the measure of the household income level, and H, A and R are household size, age of the head of household and geographical region, respectively. Estimating this model with cross-sectional data uncovers the "separate" and "partial" effects of income and the other right-hand side variables on expenditure patterns of households (Michael 1972: 22). Clearly, researchers cannot know (or have data that speaks to) all the determinants of expenditure on a given item; Engel curve analysis does not presume that a given list of determinants fully determines expenditure patterns but rather that "changes in the level of income, et cetera, are closely associated with changes in expenditures on goods" (Michael 1972: 23).

In a given cross section, it is assumed that all consumers face the same prices since they complete budget surveys during a brief time-span. For Brown and Deaton (1972), one of the main advantages of cross-sectional household budget data, over time series data, is that the income-consumption relation can be studied in isolation from price changes. Comparing Engel curve estimates at two different moments in time,

however, implies some confidence that relative prices (in market goods and in women's unpaid time) remain fixed over time; this confidence is unwarranted, as discussed in Chapter 2. The models below control for these relative price shifts.

Total resources are typically defined in one of two ways: total income or total expenditures. Clearly, total expenditure is the generally preferred measure of household ability to pay, since households rely on savings and/or credit cards. However, I use total income rather than total expenditure as an independent variable; household income is "a good candidate to be an instrument for expenditure" because it is "highly correlated with actual total expenditure but is measured independently (Deaton and Paxson 1998: 914)." According to Haque (2005), single expenditure models with total expenditure as an independent variable produce inconsistent estimates of Engel parameters, while family income as an instrument for total expenditure yields consistent estimates of Engel parameters for the double log and linear Engel functions.

The dependent variable (expenditure on a given good) varies by study. Some authors use per capita expenditure or the natural log of it. Others use the ratio of expenditure to total household income.

3.5.1 Using Engel curve analysis to infer scale from household production

The food share of the budget is unique because it falls in the middle of the spectrum of completely private goods (e.g. transportation and clothing) and completely public goods (e.g. housing). Using the 1960/61 and 1972/73 Consumer Expenditure Survey, Nelson quantifies the scale differences by good for households containing just two adults between the ages of 35 and 55: "Economies of scale were the highest for

shelter ('two can live as cheaply as one-half') and lowest for transportation ('two can live as cheaply as 1.48')" (Nelson 1988: 1,308). Scale from food fell in the middle: two could live as cheaply as 1.19.

An ideal household-level measure of scale economies from food would reflect a weighted average of the scale economies associated with each type of meal, i.e. meals at home from unprocessed ingredients, meals at home from prepared ingredients and meals out (or "away"). Such a measure would enable me to *directly* answer the research question I pose at the outset: Did greater reliance on prepared foods and other "food away" (including meals purchased in restaurants or fast food, carryout and home delivery) reduce economies of scale from meal preparation. Data limitations preclude the calculation of such a measure of household-level economies of scale from meals.

Engel curve analyses can be used to answer my research question *indirectly*; they quantify a change in scale economies from food budgets overall, not by food type. That is, the Engel curve analyses presented below do not parse the share of the loss of scale that is due to the shift toward meals out versus prepared foods for use at home. In sum, the shift toward meals that yield minimal or zero scale economies is a *plausible* explanation for the fall in scale described in the remainder of the essay.

Household production theory does not direct empirical researchers to use a particular empirical specification when testing theories of time or budget allocations in general, or for measuring economies of scale parameters in particular (Michael 1972; Haque 2005). As a result, Engel models frame scale economies in households in several

ways.[36] They do share one characteristic, however; these models isolate size from composition effects (i.e. expenditure differences that reflect different caloric needs, for example) by including both a household size variable, as well as variables that capture the proportion of people that belong to a given age category, i.e. number of babies as a share of household size, number of children as a share of household size and number of teens as a share of household size.[37]

I employ two econometric specifications; in each case, household income, not utility, is being held constant. Both specifications flow from the following question: If you double the number of people in the household, what percent would food expenditure increase? Economies of scale are present if food expenditure increases more slowly than the number of people. This result is evidenced by a coefficient on household size that is a negative fraction; the more negative the fraction, the more economies of scale from additional household members.

3.5.2 Empirical Strategy

I measure household scale economies for food using two specifications. In both cases, the result of interest is the coefficient on the natural log of household size. In the first specification, the dependent variable is the natural log of per capita food expenditure; this "double-logarithmic function is convenient (and commonly used) because it "gives the elasticities directly as coefficients" (Brown and Deaton 1972: 1150).

[36] Although it was Prais and Houtthakker (1955) and Barten (1964), rather than Engel (1895), who developed the formal models of scale economies, empirical models like those shown below are referred to as "Engel curves."

[37] For example, Lanjouw and Ravallion (1995), Deaton (1997) and Logan (2008) isolate size from composition effects in this way.

In the second specification, the dependent variable is the share of the total household income devoted to food; this method is advantageous because it yields a scale value that can be used in equivalence scales, as described in the next chapter.

For each specification, I use three models that vary by the number of regressors included. Like Logan (2008) and others, I include ratios of child counts per age group as a share of the total household size; these ratios allow me to measure the effect of household size separately from household composition. I include the additional two models for each specification (i.e. Models 3.3 and 3.4 below) in order to determine whether the omission of the additional regressors diminishes the value of the coefficient on household size.[38] Finally, all models are estimated using Weighted Least Squares, rather than Ordinary Least Squares, for reasons discussed in Appendix B.

Specifically, in the first specification, Model 1 takes the form

$$\ln(foodpc_{ij}) = \beta_0 + \beta_1(xpc_i) + \beta_2(hhsize_i) + \beta_3(babyhhsize_i) + \beta_4(childhhsize_i) + \beta_5(teenhhsize_i) + \varepsilon_{ij} \quad (3.2)$$

where $foodpc_{ij}$ is per capita food expenditure for household i; xpc_i is per capita weekly income; $hhsize_i$ is household size; $babyhhsize_i$ is the ratio of the number of babies (age 0-2) to the total household size; $childhhsize_i$ is the ratio of the number of children (age 3-15) to the total household size; $teenhhsize_i$ is the ratio of the number of teens (age 16-17) to the total household size.

Model 2 takes the form

$$\ln(foodpc_{ij}) = \beta_0 + \beta_1(\ln(xpc_i)) + \beta_2(\ln(hhsize_i)) + \beta_3(babyhhsize_i) + \beta_4(childhhsize_i) + \beta_5(teenhhsize_i) + \beta_6(fhours_i) + \beta_7(fweeks_i) + \beta_8(feduca_i) + \beta_9(mhours_i) + \beta_{10}(mweeks_i)$$

[38] This result is expected; controlling for household size but not paid work time leads to bias because the labor supply decisions of women are correlated with the presence and ages of children in the household (Browning and Meghir 1991).

$$+ \beta_{11}(\text{meduca}_i) + \beta_{12}(\text{fage}_i) + \varepsilon_{ij} \quad (3.3)$$

where the additional regressors (relative to Model 1) are as follows: fhours_i is a woman's weekly paid work hours; fweeks_i is a woman's paid weeks per year; feduca_i is woman's educational attainment; mhours_i is a man's weekly paid work hours; mweeks_i is a man's paid weeks per year; meduca_i is a man's educational attainment; fage_i is a woman's age.

Model 3 takes the form

$$\ln(\text{foodpc}_{ij}) = \beta_0 + \beta_1(\ln(\text{xpc}_i)) + \beta_2(\ln(\text{hhsize}_i)) + \beta_3(\text{babyhhsize}_i) + \beta_4(\text{childhhsize}_i)$$
$$+ \beta_5(\text{teenhhsize}_i) + \beta_6(\text{fhours}_i) + \beta_7(\text{fweeks}_i) + \beta_8(\text{feduca}_i) + \beta_9(\text{mhours}_i) + \beta_{10}(\text{mweeks}_i)$$
$$+ \beta_{11}(\text{meduca}_i) + \beta_{12}(\text{fage}_i) + \beta_{13}(\text{homeownership}_i) + \beta_{14}(\text{rprice1}_i) + \beta_{15}(\text{rprice2}_i)$$
$$+ \varepsilon_{ij} \quad (3.4)$$

where the additional regressors (relative to Model 2) are as follows: homeownership_i is a homeownership dummy; rprice1_i is the ratio of the price of food away to that of food at home; rprice2_i is the ratio of the price of food to that of all items less food.

In the second specification, the independent variables remain the same as the first one. However, the dependent variable is food expenditure as a share of household income, or the "food budget share." Like the first specification, the size elasticity measure is β_2 (Logan 2008). However, this model also yields a second measure of scale, theta, which incorporates not only the *size* elasticity of demand for food, β_2, but also the *income* elasticity of demand for it, β_1.[39] Specifically, theta represents "the power by which the effective household size increases for that consumption good with an additional member of the household" (Logan 2008: 39). Therefore, a *lower* value of theta

[39] The "theta" method used here is from Deaton's 1997 *The Analysis of Household Surveys*, pages 262-264. Nelson (2012) points out that in this book, Deaton describes the method and then says it is "unsatisfactory" and spends the rest of the section criticizing it. Logan (2008) summarizes Deaton's critiques in an appendix but uses the method anyway; he points to the counter-intuitive results it yields, including higher scale from food away than food at home.

represents a *higher* degree of economies of scale. Measuring theta using this approach, as I do below, is useful in its own right for tracking changes over time; it is also useful because it can be employed as a parameter (on household size) in standard "parameter-based equivalence scaling formulas," as shown in Chapter 4.

Theta is calculated in two steps. First, regress the food share of the total household budget on a constant term, ln(per capita income) and ln(family size) and a set of household composition variables. Second, define theta as follows

$$\theta = 1 - (\beta_2/\beta_1) \qquad (3.5)$$

Implicitly, no economies exist in this formulation when an increase in per capita household income, represented by β_1, is exactly offset by per capita expenditure on food, represented by β_2.[40] I discuss both measures of scale yielded by the second specification.

3.6 Results

Specification 1: ln(per capita food expenditure) = f(ln(household size), additional regressors)

As expected, the coefficient on family size becomes less negative over time, suggesting that scale economies fell. That is, the drop in food expenditure associated with the "extra person" was smaller in 2000 than in 1980. Also, this result becomes more pronounced as regressors are added; the coefficient on household size falls by 43 percent and 64 percent in Models 1 and 3 respectively. These results are shown in Table 3.3. Like these elasticity results, the marginal effects (yielded by the linear, rather than double log, form of these models) shifted in the same direction: the coefficient on household size became less negative over time, as shown in Appendix C.

[40] Singh (1972) describes the derivation of theta in more detail.

These results reiterate those in the food away model in the previous chapter; they suggested that parents increasingly bought time with their kids by outsourcing meal preparation/clean-up, a shift that was partly facilitated by a fall in the price of food relative to all non-food items. They also place this result in a familiar context; using this model, the shift is described in terms of the "size elasticity of demand" for food.

Table 3.3 Scale Economies in Food (Method 1 of 2), 1980 & 2000 (WLS)

Dependent variable: ln(food expenditure / household size)						
Note: household is abbreviated as "hh" below.						
	Model 1		Model 2		Model 3	
	1980	2000	1980	2000	1980	2000
Intercept	2.37	1.64	2.33	1.72	4.23	2.84
	41.9	27.4	39.6	27.8	5.1	5.9
LN (weekly income / hh size)	0.32	0.40	0.28	0.39	0.27	0.38
	27.5	34.2	22.7	29.6	21.6	28.2
LN (hh size)	-0.33	-0.19	-0.48	-0.18	-0.54	-0.20
	-12.9	-8.3	-13.7	-6.6	-15.1	-7.0
Number of babies / hh size	-0.35	-0.57	-0.16	-0.61	-0.06	-0.59
	-4.1	-8.4	-1.8	-8.5	-0.6	-8.0
Number of children / hh size	-0.06	-0.08	0.24	-0.05	0.27	-0.03
	-0.9	-1.3	3.2	-0.8	3.7	-0.5
Number of 16 & 17 yr olds / hh size	0.17	-0.21	0.30	-0.15	0.25	-0.11
	1.2	-1.9	2.1	-1.3	1.7	-1.0
LN (woman's paid hours per week)			0.00	-0.01	0.01	-0.01
			-0.3	-0.9	0.7	-0.5
LN (woman's paid weeks per year)			0.01	0.02	0.00	0.02
			0.9	1.3	0.3	1.2
College+ (woman)			0.02	0.02	0.00	0.01
			0.8	0.7	-0.2	0.5
LN (man's paid hours per week)			0.05	-0.03	0.06	-0.04
			2.6	-1.3	3.0	-1.9
LN (man's paid weeks per year)			0.03	0.02	0.02	0.04
			1.9	1.1	1.0	1.7
College+ (man)			0.04	0.11	0.04	0.12
			1.5	4.0	1.6	4.3
Woman's age			0.00	0.00	0.00	0.00
			2.2	-3.3	0.6	-3.1
Homeowner (1=own; 0=rent)					0.17	-0.01
					5.9	-0.4
Ratio: food CPI / all non-food items CPI					-3.08	0.53
					-4.7	1.1
Ratio: food away CPI / food at home CPI					1.55	-1.58
					1.3	-5.7
Percent decline in economies of scale	43% decrease		62% decrease		64% decrease	
R squared	0.43	0.32	0.46	0.33	0.47	0.34
Note: Values below coefficients are T-statistics.						

Specification 2: food budget share = f(ln(household size), additional regressors)

This specification yields two measures of scale, shown in Table 3.4 (Logan 2008). The first measure, the coefficient on household size, yields a fall in scale in just two of the three models; in Models 2 and 3, the coefficient on household size becomes less negative over time. (In Model 1, it becomes slightly more negative.) In other words, the marginal person reduces the food share of the budget, in part because of the economies of scale from the household production of meals.

The second measure of scale, yielded by this specification, also suggests that scale fell over this period. The second measure is depicted in equation 3.5 and included at the bottom of Table 3.4. In Model 1, theta falls from 0.875 to 0.646, a 26 percent drop. According to Model 2, theta increased from 0.453 to 0.654, a 44 percent jump. Finally, in Model 3, theta increased from 0.296 to 0.623, a 110 percent increase.

Table 3.4 Scale Economies in Food (Method 2 of 2), 1980 & 2000 (WLS)

Dependent variable: (food expenditure / household income)						
Note: household is abbreviated as "hh" below.						
	Model 1		Model 2		Model 3	
	1980	2000	1980	2000	1980	2000
Intercept	1.93	1.20	1.86	1.21	3.22	2.08
	61.7	66.6	58.3	65.4	7.3	14.6
LN (weekly income / hh size)	-0.30	-0.17	-0.32	-0.18	-0.32	-0.18
	-47.3	-48.1	-48.1	-45.6	-49.1	-45.4
LN (hh size)	-0.04	-0.06	-0.17	-0.06	-0.23	-0.07
	-2.7	-8.9	-9.2	-7.4	-11.9	-8.2
Number of babies / hh size	-0.36	-0.14	-0.20	-0.18	-0.10	-0.16
	-7.7	-6.9	-4.2	-8.4	-2.1	-7.2
Number of children / hh size	-0.19	-0.02	0.03	-0.02	0.06	-0.01
	-5.1	-1.2	0.9	-1.3	1.5	-0.5
Number of 16 & 17 yr olds / hh size	0.05	-0.06	0.19	-0.06	0.13	-0.05
	0.6	-1.8	2.4	-1.8	1.7	-1.5
LN (woman's paid hours per week)			0.04	0.00	0.06	0.00
			4.8	0.4	6.4	0.3
LN (woman's paid weeks per year)			-0.03	0.01	-0.04	0.01
			-3.4	1.8	-4.4	2.2
College+ (woman)			0.04	0.03	0.03	0.02
			3.1	3.8	2.3	3.2
LN (man's paid hours per week)			-0.01	-0.01	0.00	-0.01
			-1.4	-0.8	-0.1	-1.6
LN (man's paid weeks per year)			0.08	0.01	0.06	0.01
			8.2	0.8	6.1	1.6
College+ (man)			-0.01	0.04	-0.01	0.04
			-0.6	4.6	-0.4	4.7
Woman's age			0.00	0.00	0.00	0.00
			3.7	-3.0	0.5	-3.3
Homeowner (1=own; 0=rent)					0.16	0.01
					10.7	1.4
Ratio: food CPI / all non-food items					-0.84	-0.32
					-2.4	-2.1
Ratio: food away CPI / food at					-0.46	-0.53
					-0.7	-6.5
Economies of scale						
value*	0.875	0.646	0.453	0.654	0.296	0.623
percent change	26% increase		44% decrease		110% decrease	
*Calculation: 1-[coefficient of LN(hh size)/ coefficient of LN(weekly income/hh size)						
R squared	0.48	0.32	0.54	0.34	0.56	0.35
Note: Values below coefficients are T-statistics.						

3.7 Conclusion

During the 1980s and 1990s, food preparation changed both socially and technically. Socially, time use data indicate that food preparation became somewhat less gendered. This shift may have contributed to another one: meal preparation became a smaller component of unpaid work. Households opted for time-saving meal options, including frozen food and meals out. Technical advances likely mediated the shift to time saving options; that is, technical advances reduced the cost of durable goods (e.g. dishwashers and microwaves) that lower the time needed for meal production at home.

These changes have important implications for a core determinant of living standards, namely the ability to harness economies of scale from home production of meals. In this essay, I use the diary portion of the Consumer Expenditure Survey to measure the loss of economies of scale associated with the shift away from food at home using unprocessed ingredients toward prepared food for use at home and meals out. My lower and upper bound estimates of the drop in scale economies are 44 percent and 110 percent respectively. If time inputs for meal production yield greater scale economies than food expenditure, as Vernon's analysis suggests, then these are lower-bound estimate of the drop in scale; they represent food expenses, not time spent preparing meals.

CHAPTER 4

EQUIVALENCE SCALES AND MARRIED PARENTS' RELATIVE WELL-BEING: A SENSITIVITY ANALYSIS

4.1 Introduction

Did the living standards of married parents, relative to married childless couples, deteriorate during the 1980s and 1990s? To answer this question, the two groups' household incomes must, at the very least, be adjusted for differences in size and composition. Such adjustments, made through equivalence scales, reflect the extent to which households can harness economies of scale from household production and relative expenditures on children compared to adults. Only changes in household size and composition are reflected in standard scales; the scales themselves are presumed to remain fixed.

Equivalence scale assumptions are particularly relevant to consideration of the relative well-being of parents and non-parents, both because they embody assumptions regarding the cost of children relative to adults and because household size (and economies of scale) are largely a function of the number of children. The standard assumption (within the equivalence scaling literature) that children cost less than adults ignores the cost of time devoted to their care and supervision. Yet mothers' growing labor force participation during the 1980s and 1990s led to concomitant growth in expenditures on child care and meals out; equivalence scales should reflect mothers' changing propensities to outsource child care and meal production.

My hypothesis is that the relative well-being of parents is overstated by standard equivalence scales because those scales obscure important changes in the costs of children and "second" adults working for pay. I compare the equivalent income trajectories (of married couples with and without children) from two standard scales (where parameters are constant over time) and three *non-standard* scales (where parameters vary over time in accordance with growing reliance on market substitutes).

The value-added of this essay is three-fold. First, I bridge the parameter-based equivalence scaling literature and the household production literature. I argue that conventional equivalence scales ignore changes in both household economies of scale and the relative costs of adults and children over time. Second, I construct plausible time-varying values for the effects of household composition on living standards, based on consideration of the changes described above. Third, I contrast equivalent income trajectories across standard and non-standard scales; I present lower- and upper-bound estimates of the understatement of the deterioration in parents' equivalent income relative to that of their childless counterparts.

The rest of this essay is organized as follows. Section 4.2 motivates an exploration of the assumptions embedded in equivalence scales by demonstrating the sensitivity of equivalent income to the scale that is used to define it. Section 4.3 highlights attempts to derive equivalence scales from household consumption data and the debate over whether to include child costs in equivalence scales. It then describes a branch of the equivalence scaling literature that emerged largely as a result of the pitfalls associated with deriving equivalence scales from household consumption data, namely parameter-based scales. Section 4.4 first motivates my own theoretical framework by

framing it as a bridge between the household production literature and the parameter-based equivalence scaling literature. In the second half of this section I present my own theoretical framework for deriving equivalent income. Section 4.5 covers the data, sample selection, summary statistics, standard and non-standard scale definitions and the empirical model. Section 4.6 contains the empirical results. Section 4.7 summarizes the main conclusions.

4.2 The significance of equivalence scale assumptions for relative living standards

Policymakers and others interested in tracing groups' relative financial well-being, have little appreciation for how consequential equivalence scales are for the measurement of relative living standards—especially the relative position of families with and without children. Partly as a result, the use of the square root scale and two- or three-parameter scales has become the norm; several national statistical offices (in Denmark, Germany, France and the UK) officially adopted a "two-parameter" or "Oxford/OECD" scale (Van Praag and Warnaar 1997). Despite a large academic literature on "scale relativities," i.e. the sensitivity of poverty rankings to equivalence scale choice, governmental statistical agencies and other groups that disseminate public policy analysis typically do not mention the precariousness of their findings.

At the very least, equivalence scales are used to adjust household income so that it accounts for scale economies in the household. Deaton and Muellbauer contrast scales that generate per *capita* income and per *equivalent* income as follows: "Household equivalence scales are deflators that are more sophisticated than mere head counting and by which the budgets of different household types can be converted to a needs-corrected basis" (1980: 192). The limitation of the per capita scale (i.e. of "mere head counting") is

that households' needs are assumed to increase "linearly and identically" with each additional household member. Yet this assumption does not hold if the needs of a child are less than those of an adult. Also, by definition, needs cannot increase linearly where economies of scale in consumption are present; in this case, they must increase more slowly (Slesnick 2001).

Scale economies are an intuitive concept that can be illustrated with a simple example. If a family containing two adults and a child had three times the expenditure of a single adult, is the three-person family better or worse off than the single adult? Most observers would describe the three-person family as better off, which reflects the assumption that needs do not increase in a linear fashion (Deaton and Muellbauer 1980: 193).

As this example suggests, the term "scale economies" refers to the resources that are freed up by sharing in larger households. These "economies" are "instances in which the average cost of a good or service falls as its output rises" (Bryant and Zick 2006: 167). Scale economies from sharing (also termed "size economies") come from the consumption of both goods and services. Examples of the former include discounts on bulk purchases, passing clothes from an older child to his younger sibling, and less waste of food (Prais and Houthakker 1955; Nicholson 1976; Nelson 1988). Scale from the consumption of services, rather than goods, is measured in time. Cooking, for example, has declining marginal cost measured in time: "cooking for two is only slightly more time intensive than cooking for one" (Jacobsen 1994: 76). In other words "the increase in food preparation time is proportionately less than the increase in family size" (Bryant and Zick 2006: 167). In summary, for a given level of per capita income, a relatively large

household theoretically enjoys a higher standard of living than a smaller one, because the former benefits from sharing a variety of goods and, more importantly, services performed by one household member for the benefit of herself and others.

Chart 4.1 illustrates how seemingly-small differences in scale definition yield a large difference in relative incomes by family type. It depicts how three commonly-used equivalence scales, namely the per capita scale, the square root scale and the National Academy of Science (NAS) scale, translate $50,000 in to equivalent income across four household types: 2 adults; 2 adults, 1 child; 1 adult; 1 adult, 1 child.

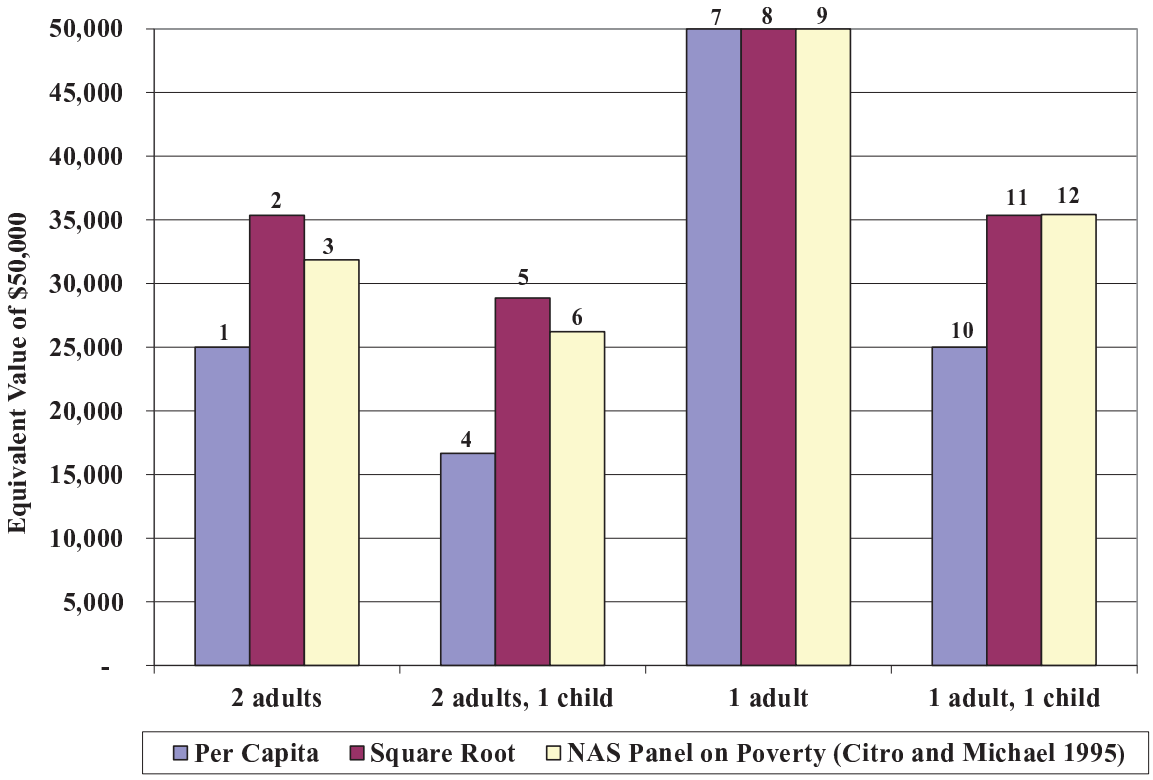
The first of these three scales, the per capita scale, assumes no economies of scale. The second scale, the square root scale, assumes a relatively high level of scale economies. The third scale, the NAS scale, assumes an intermediate degree of economies (more than the per capita scale but less than the square root scale) but accounts for the lesser (caloric) needs of children. These three scales are represented algebraically as follows:

<u>One-parameter scale</u>: Income / $(A+C)^{\theta}$, where A is the number of adults, C is the number of children, and theta is the scale parameter. The scale elasticity term (theta) is "the power by which the effective household size increases with an additional member of the household" (Logan 2008). This value is 1 when few scale economies are present and 0 when many economies are present. If each additional person adds the equivalent of, say, three-fourths of a person, then economies of scale are relatively weak. In contrast, if each additional person adds only the equivalent of one-fourth of a person, then economies of scale are relatively strong. In the extreme case, of theta equal to zero, economies of scale are said to be "perfect" in the sense that households containing two or members can live

exactly as well as a household containing just one person, with no addition in disposable income (Burkhauser, Smeeding and Merz 1996). By definition, the per capita scale is the special case where theta is set to 1; the square root scale is the special case where theta is set to 0.5.

Two-parameter scale: Income/ $(A + bC)^{\theta}$, where the new parameter, b, represents the needs of children relative to adults. The NAS scale is the special case where the child/adult parameter, b, is set to 0.7.

Chart 4.1: Impact of Scales on Equivalent Income by Household Composition



Looking first the per capita scale, the key point is that it is insensitive to household composition. That is, whether a two-person household contains two adults or an adult and a child, it generates equivalent income of $25,000; each person commands $25,000 for a total of $50,000. (Bars 1 and 10 are the same height.) In a three-person

household, a per capita measure shows each person commanding $16,667 (bar 4) and a single person $50,000 (bar 7). With the exception of the single-adult household, all the other measures shown are higher relative to per capita bars (per three-bar cluster), because they assume some economies of scale. By definition, for a two-adult or a two-parent household, economies of scale lead to greater equivalent income. The simple square root scale yields the highest equivalent income for households with two adults (the middle bar in each cluster is the tallest). However, in the single-parent case, the NAS scale yields slightly higher equivalent income because it weights children less than adults (see bars 11 and 12).

Looking next at the square root scale and the NAS scale in two person households, it is clear that the square root scale is also blind to household composition; bars 2 and 11 are the same height. In contrast, bar 3 is shorter than bar 12, since the latter assumes a child is less costly than an adult. Specifically, the NAS scale assumes that children (of any age) require only 70 percent of what an adult requires.

Looking at all three scales in the two adult versus the two adults (parents), 1 child household, we see that the ratio of bars 5 and 2 is the same as that of bars 6 and 3. That is, both the square root and the NAS scale generate this result: parents of one child have 82 percent of childless couples' equivalent income. The per capita scale, in contrast, yields a larger divide: the ratio of bar 4 to bar 1 is much lower, just 67 percent. Relative to bar 1, bar 4 is low because no scale economies are embedded in the per capita scale.

Looking at all three scales by number of parents, i.e. bars 4, 5 and 6 compared to bars 10, 11 and 12, it is clear that the single-parent cluster is much taller than the two-parent cluster. Specifically, the ratio of equivalent income of two-parent household to

that of single-parent households is 67 percent, 82 percent and 74 percent for the per capita, square root and NAS scales respectively.

Finally, looking at parents and non-parents by marital status, i.e. bars 1, 2 and 3 relative to bars 4, 5 and 6 and bars 7, 8 and 9 relative to 10, 11 and 12, we see a bigger drop in the latter comparison. That is, the difference between parents and non- parents is bigger for singles; by these assumptions, a child reduces living standards more in single-parent households than in two-parent households.

4.3 Parameter-Based Scales: Methodologies and Controversies

A sizeable literature is devoted to devising equivalence scales; Van Praag and Warnaar (1997) summarize 76 methods proposed over time.[41] As this large number of methods suggests, there is no consensus among academic economists about whether or not living standards can be deduced by tracing expenditure patterns alone. Despite disagreement on a theoretical level, a number of approaches are used to make such deductions in practice. A simple approach is to compare trends in budget-share trajectories by group. For example, Johnson, Smeeding and Torrey (2005) deduce relative living standards of parents and non-parents from trends in expenditure shares. They report that between 1981 and 2001, the share of all expenditure on shelter, vehicles and medical needs, for example, increased faster for couples with children than it did for single elderly and nonelderly. Specifically, this share jumped by 10 percentage points among couples with children, from 29 percent to 39 percent, but by only 7 percentage points among single elderly and nonelderly, from 35 percent to 42 percent. The authors

[41] They group the 76 methods in to the following five categories: budgetary approaches, proportional methods, consumption theory, subjective scales and "other scales" (i.e. the square root of family size and the OECD/Oxford scales).

infer from these findings that the living standard of couples with children declined relative to that of childless couples.

The limitation of this approach is that it does not control for variation in demographic characteristics of households (such as the age of the adults) or labor force attachment. While equivalence scaling methods generally *do* attempt to control for such variation, other conceptual and methodological pitfalls preclude the derivation of meaningful equivalence scales from expenditure patterns alone; in particular, additional assumptions have to be made which cannot be verified (Betson 1996: 37).[42]

Equivalence scales generally rely on rather arbitrary assumptions. Many methods of devising equivalence scales echo Ernst Engel's famous observation. In 1857, Ernst Engel noted that the share of total income spent on food is inversely related to household income: a rise in household income is associated with a fall in the share of the household budget spent on food. He posited that the food share offers an important indicator of living standards; for him, two households with identical budget shares devoted to food are equally well off. That is, the cost of an additional family member is the amount that must be added to the budget to restore the family's food share to its original value" (Citro and Michael 1995: 170).

Many neoclassical theorists build their equivalence scales on the premise that households that spend the same percentage of their budget on food are at the same level of utility.[43] Others build their scales on the premise that two families (of differing

[42] Triest (1998) provides a non-technical description of the controversies around the question of whether it is possible to identify equivalence scales using consumer expenditure data in a way that is consistent with the principles within consumer demand theory.
[43] In this framework, household utility is maximized subject to a budget constraint; the solution to the system of equations (one equation per category of good consumed by the household such as

compositions) that spend the same share of their budgets on a given item (such as food) or bundle of items (such as food, housing and other "necessities") are equally well-off. Using this method, households with two children, for example, are compared to a reference household (married couples without children).

Rothbarth (1943) disagreed with the idea that food share of the budget can reflect a certain living standard and used expenditure data in another way. He selected a set of adults goods (including saving) and calculated how much the total was reduced by the presence of an additional child; the idea was that children bring needs that can only be making cuts elsewhere in the household budget (Citro and Michael 1995). The cost of children relative to the adults is then how much income would have to rise to restore the original expenditures (Deaton 1997).

While these early theorists focused solely on measuring the costs of children, Barten (1964) modeled these costs and scale economies jointly. In the discussion section following his article, he writes: "…economies of scale and the effects of household composition can be treated in one single framework… In my theoretical derivations, I did not assume that if income and the number of persons in each group double, the expenditure pattern is unaltered" (297).

4.3.1 Should the costs of children enter equivalence scale calculations at all?

Not all economists agree that the cost of children should be considered in equivalence scale calculations. For example, Van Praag and Warnaar (1997) argue that children and "luxury" food (or other "adult goods," including tobacco and alcohol) may

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food, transportation, etc.) indicates the amount of money that would enable two households of differing compositions to attain a common level of utility (Triest 1998).

be substitutes for each other: "Just as with Rothbarth's method, it is not clear that food (especially luxury food) is not a substitute for having children and deriving utility from them." On the other hand, the accurate measurement of children's well-being (and that of their parents) is at stake. As a result, many economists argue that both direct and indirect costs of children should be embedded in the design of equivalence scales.

The notion that the relative cost of children has no place in an equivalence scale echoes the "the first and still most fundamental" decision handed down by the Board of Tax Appeals regarding the question of whether child care expenses should be deductible from parents' income taxes; the 1939 ruling was that child care expenses are non-deductible since they are caused by the personal decision to have children (McCaffery 1997).

Economists have incorporated this logic to varying degrees. Garfinkel and Haveman (1977) suggest that in an "ideal equivalence scaling framework, the net benefit of children would equal the gross flow of satisfaction they convey less the costs required for their care" (1977: 55). Moreover, if the presence of children conveys no utility, then "only the subtraction of required childcare is necessary" (1977: 55). While Garfinkel and Haveman mull over various "ideal methods" in order to justify their own (which *does* subtract "the cost of a minimally acceptable level of child care" from income), Ferreira and her coauthors (1998) take a more aggressive stance. They apply Garfinkel and Haveman's "ideal equivalence scaling framework" to the question of whether the official scale embedded in the poverty thresholds is misleading.

In their explanation of what they view as overly-generous poverty thresholds, Ferreira and her colleagues argue that the utility derived from children should be viewed as a resource for parents:

> If it is true that parents derive pure utility from children, then what they need to reach the same welfare level [as non-parents] is less than what the 'official' equivalence scale indicates….Note that this inference does not state that the incomes implicit in the poverty line are enough to reach adequate standard of living. Rather, the increase in income necessary to achieve the 'same welfare' level in the official poverty line might be overstated (Ferreira, Buse and Chavas 1998: 194).

This assessment leads to extreme conclusions; it implies that "the welfare of children should not count in any academic or social calculus" (Bojer and Nelson 1999: 532).[44]

In contrast to the framework proscribed by Ferreira et al., Johnson and Pencavel (1980) make a case for the development of scales that include both direct and indirect costs of caring for one's own children, namely the "loss in earnings potential." They argue that scales that compensate families for purchasing the time of others but not that of children's own mothers "tacitly penalizes mothers who reallocate either their market work time or their pure leisure time to the raising of their children" (Johnson and Pencavel 1980: 230).

Folbre (2008) argues for scales that reflect a broader definition of these costs:

> Simple models of the ratio of household resources or consumption to needs understate the needs that children impose. Most emphasize necessary goods such as food, clothing and shelter but neglect necessary services such as child care, education and health care. More profoundly, conventional approaches ignore nonmarket work in the home, which both contributes to household standards of living and imposes costs on those who perform it on behalf of children and other dependents (Folbre 2008: 62).

[44] Ferreira and her colleagues claim that their article "abstracts from the problems of value judgements and ethical standards" (Bojer and Nelson 1999: 532). Bojer and Nelson argue that the truth is just the opposite. They describe Ferreira and her colleagues' view as "repulsive" and note that it "seems to be widespread among economists (perhaps because we are used to dealing only with models of autonomous, rational agents)" (1999: 532).

4.3.2 What expenditures should be included in equivalent-income calculations?

Another issue that arises in the discussion of equivalence scale calculations is that outcomes hinge on the definition of "necessary" expenditures. For instance, should the definition of "food" include alcohol and meals out (Van Imhoff and Odink 1992)? Over time, definitions of "necessities" change. In the U.S. today, meals out are hardly considered a luxury. Likewise, many parents of young children consider purchased child care services and/or early childhood education a necessity.

Watts (1977) addresses this problem with his "ISO-PROP" (or "same proportion") approach, a variant on the Engel framework that expands the scope of the variable of interest. His method is based on not just the budget share devoted to food but also that devoted to clothing, housing, utilities and health care. The logic of the ISO-PROP measure is that, holding total expenditures constant, the budget share spent on these goods should rise when children are present. This difference yields the equivalence scale: "The difference between the level of total expenditures required to maintain a given budget share spent on these goods for households of different compositions would estimate the economic costs of the different compositions of the households" (Betson 1990: 13).

Even if one assumes that expenditures on children *should* be included in scale calculations, as Watts' ISO-PROP method does, this method is still inadequate for comparing the well-being of parents and non-parents. For example, if parents are competing for good school districts (thereby driving up housing prices in those neighborhoods), as Warren and Tyagi (2003) suggest, then families with children may have to spend *a higher* share of their budget on housing, in a given year, to be as well off

as a childless couple. Or, if parenting norms are shifting such that child care and meal prep are increasingly considered substitutes rather than complements, parents may need to spend a larger share of their total household budget on convenient meals (i.e. prepared foods and meals at restaurants) than their childless counterparts. The appeal of so-called "rule-of-thumb" scales, described below, is that they *can* incorporate proxies for these shifting norms around outsourcing meal preparation and child care, *although they do not do so currently*.

4.3.3 Parameter-based scales

The conceptual hurdles associated with using expenditure patterns to produce equivalence scales likely led many researchers to a different approach, known as parameter-based scaling. However, there is no consensus around what constitutes the right approach for calculating or assigning appropriate "equivalent factors." Some scholars use non-linear least squares, rather than the ISO PROP method, to generate values for a, b and/or theta econometrically that can be plugged in to rule-of-thumb scales. For example, Jenkins and Cowell (1994) use non-linear least squares to estimate both parameters, b and theta, in the two-parameter scale. Still there is no agreement on the best functional form; Jenkins and Cowell (1994) concede that the "the best functional form depends on the context and the goals of the analysis" (892).

Other scholars *choose* "equivalent factors" such that they vary in a logical way with need, which is inferred from household composition. Special consideration may be given to young, old or disabled persons (Sabelhaus and Schneider 1997). For example, although the elderly may have lower food requirements, this "may be offset by greater needs for fuel, lighting and domestic help" (Atkinson 1983: 52).

A panel convened by the National Research Council (NRC), a subset of the National Academy of Sciences (NAS), made the case for the two-parameter approach by noting that it is easy to explain and implement; it is "transparent." Moreover, "…the use of a scale formula of this type acknowledges the inevitable arbitrariness in adjusting the poverty thresholds for different family circumstances rather than disguising it in opaque econometric analysis" (Citro and Michael 1995: 178).

4.3.4 The child/adult (or "relative needs") parameter

The measurement of the child/adult parameter, defined as "the expenditure per child per dollar spent on an adult," varies widely in the equivalence scaling literature (Lazear and Michael 1988). For some, this is defined in terms of caloric requirements; a child can be adequately nourished with half a hamburger while an adult needs the entire hamburger (Lanjouw, Milanovic and Paternostro 1998). For others, it is defined more broadly, to include child-specific "private goods," such as clothing, education and other goods that cannot be shared with adults. That is, the child/adult parameter equals 1 if a child's need for "private goods" is just as great as an adult's need for such goods; if children's needs are less than adults' needs, the parameter is between 0 and 1.

For those thinking of the relative cost of children and adults in this broader (non-caloric based) frame, the child/adult parameter is not directly empirically identifiable. Nelson (1988) points to an especially peculiar attempt to identify this ratio empirically. Lazear and Michael's approach (1980), she argues, is not tied to economic theory. Specifically, they "come up with estimates of what a child would consume had he or she lived in a single-person household, by extrapolating from demand equations estimated over single-adult households" (Nelson 1988: 1,302). Clearly it is not realistic to posit a

child living by himself; household composition plays a key role in the allocation of household resources (including both time and money) and the extent to which scale economies arise from those choices.

Even when this econometric issue (of empirically identifying a parameter) is sidestepped, the scope of expenditures to include in the definition of this parameter is controversial. Modern economists implement Rothbarth's early idea: they compare expenditures on child and adult clothing and then assume that this ratio can serve as a proxy for all expenditures (Johnson 1998; Lazear and Michael 1980). As mentioned earlier, Rothbarth defined relative needs of children and adults by tracing expenditures that could be clearly linked to adults versus children, including clothes, tobacco and alcohol. However, Rothbarth did not live in an era of growing need for child care. If he had, he could just as easily have included child care expenditures in his list of distinctly private goods. If the child/adult parameter were defined in terms of child care costs, this parameter would rise steadily during the 1980s and 1990s. This shift would, in turn, produce falling equivalent incomes for household with children during that period.

In his effort to avoid these definitional issues, Johnson proposes arriving at a child/adult parameter by "backing it out." That is, he first calculates the "scale elasticity" term and derives the child/adult parameter from it. (He refers to this approach as one of several "minimal sharing methods.") This method assumes that "the children receive the difference between total household resources and the sum of the equivalent consumption of the adults."[45] Using this method, Johnson estimates that the sharing parameter is 0.25 for households with two adults and two children. Jenkins evaluates minimal sharing rules

[45] Algebraically, Johnson's minimal sharing rule is defined as follows: minimal sharing = equivalence scale for a household - (number of adults / number of children).

as follows: "What is being assumed is that the parents reap equal shares of the benefits from economies of scale and that each contributes in equal proportions to baby. Both suppositions are questionable, as the feminist literature reminds us" (1991: 472).[46]

Despite all the debate on how to define the child/adult parameter, and how it may be changing over time, many researchers simply avoid the issue by using the square root scale for all years under consideration. Two-parameter scales can be approximated reasonably closely with the square root scale, which depends on just a single parameter, the "elasticity of need with respect to family size" where that elasticity is set to 0.5 (Ruggles 1990: 77). The reason the square root scale closely approximates the two- and three-parameter scales is that large families tend to contain a larger proportion of children. The square root scale therefore *coincidentally* reflects a distinction between adults and children (Citro and Michael 1995). This coincidence obscures the conceptual issues surrounding the child/adult parameter (discussed above) and how it relates to the scale economy parameter.

4.3.5 Weaknesses of "rule-of-thumb" scales for analysis of parents' well-being

The square root scale has two positive attributes, according to Ruggles: it approximates the overall elasticity for the scale economies embedded within the official poverty thresholds. Also, like the official poverty thresholds, the square root scale yields a poverty threshold for a four-person family at about twice the threshold for a single

[46] Citro and Michael single out one potential proxy for the child/adult parameter and deem it inappropriate for this use: the proportion of household spending devoted to children. They point to work by Betson and Michael (1993) that describes the steps that one would go through to convert the share (expenditures on children / total expenditures) to a child/adult parameter.

adult.[47] Neither of these attributes are relevant for the comparisons made in this study: parents versus non-parents.

Moreover, parameter-based scales are limited because the child/adult parameter is framed so narrowly in terms of a subset of private goods. Defining this parameter in terms of private goods alone (as Lazear and Michael do) or as private goods *plus* a fraction of scale economies enjoyed by the household as a whole (as Johnson does) misses a broader story that should be represented by the child/adult parameter: it should include consideration of the value of family time devoted to the care of children, including but not limited to the cost of purchasing substitutes for that time, such as child care services.

4.4 The Case for Equivalence Scale Parameters That Vary Over Time

The notion that the growing reliance on market substitutes for work previously done at home, such as meal preparation and child care, should be somehow accounted for, has gained traction in recent years. Food stamp benefit levels, for example, have been altered to reflect the growing demand for prepared food. Until 2007, the federal government's food plans (used to calculate food stamp benefit levels) presumed all meals were made from scratch; according to Albelda (2011), the federal government has traditionally set food stamp benefit levels low on the premise that food stamp recipients have plenty of time to spend on home preparation. In 2007, food plans were revised to include the cost of some prepared food items purchased at the grocery store.

[47] Notably, for the most part, the representation of scale in the official poverty thresholds defies logic: "…the family size adjustments embodied in the official poverty thresholds …actually increase as family size rises, implying that families of four or more, for example, are able to take advantage of fewer economies of scale than are families of two or three" (Ruggles 1990: 72).

Turning to recent efforts to incorporate child care expenses in measures of well-being, Mayor Michael Bloomberg of New York City unveiled a new measure for gauging poverty in 2008, which takes in to account the cost of child care, among other expenses not included in the official poverty measure. According to this measure, the poverty rate in New York City in 2008 would increase to 23 percent of the population, rather than just 19 percent according to the official poverty measure (Buckley 2008). Also, in 2010, the Census Bureau developed a "Supplemental Poverty Measure" that accounts for work-related expenses, including child care (Short 2011).

4.4.1 Improving on current parameter-based methods: bridging two literatures

In order to apply this general notion to the specific task of household income calibration, two literatures must be bridged: the household production literature and the equivalence scaling literature. While standard parameter-based equivalence scales *do* include two parameters, one for the relative costs of children and adults and another for scale economies, they *do not* allow these parameters vary with parental labor force participation. To correct this shortcoming, these parameters must reflect two classes of costs identified in the household production literature: commodity and time costs of work at home and work done for pay.

Quadrants 2-4 in Table 4.1 list costs that vary with parental labor force participation. They are divided in to two classes, namely time and commodity costs, a distinction made in the household production literature. Quadrant 1 lists the commodity costs of children, which clearly do not vary with labor force participation. However, the cell is included to highlight an additional improvement in the parameter-based scale presented in this section: commodity costs of children are expanded so that they include

"relative caloric requirement" as well as parents' expenditures on children's clothing and education.

Table 4.1 Commodity and Time Costs of a Second Earner and Children

	Second Adult Working for Pay	Child
Commodity cost	women's clothes, transportation	relative caloric requirement, clothes, education
Time cost	food away	babysitting, day care

The commodity cost of a second adult, relative to the first one, is affected by her labor force participation. If both people in married couple work for pay, they likely spend more on both women's clothes and transportation, than they would if just one member of the couple did. Similarly, the time cost of a second adult increases if both partners work for pay: meal preparation that would otherwise be performed at home is outsourced. That is, consumers spend more money on both prepared foods for use at home and meals out when both members work for pay, as described in Chapter 2. Since the marginal cost of each additional meal does not fall when families eat out, as it does when they eat in, families lose out on scale economies when they opt for meals out. Turning to child costs, the time costs of children increase if both partners work for pay: child care that would otherwise be performed at home is outsourced.

Next, I illustrate an approach to "mapping" both time and commodity costs of paid work (a distinction made in the household production literature) on to the standard parameter-based equivalence scaling framework. The value-added of this scaling method is that it is robust to changes in norms, which are partly driven by women's work force participation, namely greater outsourcing of meal preparation and child care.

4.4.2 Mapping Expenditure Shares on to an Equivalence Scaling Framework

Two approaches to approximating equivalent income are shown in Table 4.2: the standard one on the left and a new one on the right. Looking on the left side, theta, the scale economies parameter, generally takes a value of 0.5 (for the square root scale) or one (for the per capita scale). The approach shown on the right side of Table 4.2 is relatively comprehensive; it includes both the value of market work and home production in the numerator and proxies for the commodity and time costs of children and a second adult that works for pay in the denominator.

The approach shown on the right side of Table 4.2 differs from the two-parameter approach described earlier: there is no scale parameter. Instead, two parameters are attached to each of two variables, namely adult and child counts. The generic form of the scale shown in Table 4.2, initially proposed by Betson (2004), is: Income / (1 + a(A -1) + bC), where the new parameter, a, represents the needs of the second adult relative to the first. The second parameter, b, still reflects the needs of children relative to adults.

Conceptually, the approach depicted in Table 4.2 is the opposite of the one I employ in Chapter 3. In that case, relative needs are ignored while the scale parameter is measured separately in both years. In the results section of this essay, I compare the equivalent income trajectories associated with both approaches; the first "non-standard" scale allows scale to vary (but does not incorporate the relative needs parameter) while the second and third "non-standard" scales allow the relative needs parameter to vary (but do not incorporate scale). The two approaches yield similar results.

Table 4.2 Approximating Equivalent Income

$\frac{Y}{n^{\theta}} = \frac{Y_m + Y_h}{(1 + A(\alpha_c+\alpha_t) + C(\beta_c+\beta_t))}$	
Y= total household income	
n = number of household members	
θ = overall scale economies (from consumption and production)	
Y_m = household market income	
Y_h = value of household work	
A = 1 (the first adult)	
α_c = commodity costs of second adult	
α_t = time costs of second adult	
C = number of children per household	
β_c = commodity costs of children	
β_t = time costs of children	
Adapted from Citro and Michael (1995); Lanjouw et al. (1998)	

Lack of data precludes the empirical implementation of the scaling approach exactly as it is shown on the right side of Table 4.2. By not imputing a value for household work in the numerator, my scale, like the standard ones, *understates* the overall living standard of households that benefit from those who devote time to nonmarket services, like cooking.[48] However, I also do not impute a value for a health insurance, a key commodity cost of children, in the denominator. While these definitional issues are worth mentioning, they are not central to the thesis in this essay; they relate to the *level* of work-related costs, rather than a *change* in these costs. As long as these cost proxies are defined consistently over time, they can be used to calculate a plausible measure of equivalent income for each household.

[48] Crucially, this logic applies to the welfare of the household as a whole, less the person devoting time to nonmarket services. For the individual adult devoting time to child care and/or meal preparation, not imputing a value for this work *overstates* living standards: if she withdrew that time, she would be forced to purchase markets substitutes for it (Folbre 2008: 60).

Table 4.3 summarizes the proxies used for the time and commodity costs described above. For one of these costs, namely the time costs of children, I include both a lower- and upper-bound proxy. The lower-bound proxy is the ratio of babysitting and day care expenditures to total expenditures, as they are reported in the Consumer Expenditure Survey (CEX); this approach constitutes a lower-bound approach because reported babysitting and day care expenditures are notoriously low. Not all expenditures are reported, and not all take the form of cash payments. Low-income women are often forced to leave children in unsafe situations while at work or "clandestinely" bring them to work (Albelda 2011). They may also rely on reciprocity with family members and friends that must be repaid with other in-kind services. For these reasons, an upper-bound estimate of these expenditures, using the "replacement cost method," is needed. Specifically, for each household, I multiply the number of hours a mother works for pay by $3 in 1980 and the inflation adjusted equivalent (of $6.27) in 2000; this is a conservative estimate of the hourly cost a working mother would incur if her child were in center-based care.

Table 4.3 Mapping Expenditures on to the Equivalent Income Framework

Cost	Proxy
Second earner	
commodity costs	(wife's clothing and transportation) / total expenditure
time costs	food away / total expenditure
Children	
commodity costs	0.70* + (children's clothing and education) / total expenditure
time costs	
lower bound	(babysitting and daycare) / total expenditure
upper bound	(imputed babysitting and daycare**) / total expenditure
*Children require 70 percent as many calories as adults (Citro and Michael 1995).	
**I impute $3 per hour of the wife's weekly paid work.	

The remainder of this section highlights studies that quantify the growing demand for market substitutes; implicitly, they underscore the importance using proxies for work-related and child costs, as shown in Table 4.3, rather than continuing to employ scales that ignore the growing demand for market substitutes.

4.4.2.1 Rising day care costs

Between 1975 and 1990, the amount paid by parents per hour of center-based and family child care changed relatively little after adjusting for inflation. Between 1990 and 1993, however, steep annual price increases occurred; in those years, prices increased about 20 percent for center-based care, family child care and relative care and about 12 percent for sitter care (Hofferth 1996: 52). This trend suggests that supply increased to meet demand prior to 1990, leaving prices relatively constant. Beginning in 1990, however, supply was not growing fast enough to meet demand, leading to the steep price increases described above (Hofferth 1996).

While many parents paid out-of-pocket for child care, they also made use of expanded public provision. State funding for kindergarten increased during this period, which translated in to free child care during the school day. Beginning in the mid-1960s, state governments began to subsidize kindergartens for the first time. Many states did not begin doing so until the 1980s (Cascio 2006).

State funding for child care increasingly became contingent on mothers' paid work during this period, with public support increasingly targeted to low-income families.[49] The stricter paid work requirement resulted in greater need for public

[49] The Family Support Act of 1988 mandated that all states run welfare to work programs. By the mid 1990s, most states had about 20 percent of their caseload either working or in work

provision of child care; between 1996 and 2000, combined federal and state funding for child care tripled (Greenberg 2005).[50] Still, a growing share of low-income parents reported out-of-pocket child care expenses during this period. Zedlewski compares this jump (between 1996 and 1998) for the bottom two quintiles. In the bottom income quintile, the share of single parents that report out-of-pocket child care expenses rose from 17 to 20 percent; in the second income quintile this share rose from 25 to 33 percent (Zedlewski 2002: 61-62).

4.4.2.2 Rising food away share as a work-related cost

Studies consistently suggest that the women's rising paid work hours during the 1980s and 1990s prompted them to seek market alternatives for their own home meal production. For example, a report by the Economic Research Service of the United States Department of Agriculture points to a correlation in the demand for fast food and hours worked for pay. Using 2004 Consumer Expenditure Survey (CES) data, they find that a typical household increases its per capita spending on fast food by about 1.4 percent following a 10 percent increase in the number of hours worked outside the home by its "manager." By contrast, this same household would increase its per-person spending at full-service restaurants by only about 0.5 percent. They summarize this result as follows: "The link between time constraints and spending for fast food-but not

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programs (Blank 1997). Likewise, one of the central stated goals of the so-called welfare reform of 1996 was to accelerate the shift from a policy of cash assistance to one of work supports (including child care and job training/job search assistance) for low-income mothers. The Personal Responsibility and Work Opportunity Reconciliation Act mandated that 50 percent of families receiving government assistance in a given state be working at least 30 hours per week.

[50] Still, only an estimated one in seven children eligible for federal child care subsidies were receiving them (Greenberg 2005).

for full-service restaurants-has been established." In other words, extra expenditure on meals out is a work-related cost.

Pasceweicz (2005) reports an analogous finding in her analysis of budget shares devoted to groceries before and after welfare reform. The "non-welfare population" spent about 1.5 percentage points less of their budget on groceries in 2001-02 than they did in 1988-89, while those receiving benefits allocated about 5 percentage points less of the household budget to groceries in 2001-02 than they did in 1988-89. The relatively large drop for those receiving benefits is consistent with the idea that this group felt pressed for time to a greater extent than non-recipients, following the enactment of welfare reform, which placed increasing weekly work requirements on benefit recipients.

Theoretically, the drop in expenditure on food at home could reflect rising family income and/or the rising opportunity cost of unpaid work, rather than falling time available for home meal preparation. Using Canadian household expenditure data from married couples in the 1980s, Nicol and Nakamura (1994) find that the share of the household budget devoted to food consumed at home of low- and high-income households match. They conclude that the number of workers in the household, rather than the income they earn, determines the share of the household budget devoted to food consumed at home.

Landefeld, Fraumeni and Vojtech (2009), in contrast, point to the importance of the rising opportunity cost of unpaid work; they use it to resolve the following puzzle. From 1985 to 2004, non-market hours spent cooking fell despite the fact that the price for food for use at home increased more slowly (2.6 percent annually) than that of meals out (3.1 percent annual rate). Why would nonmarket hours decrease when the cost of food

preparation has gotten relatively cheaper? To resolve this, they compute a price index for food cooked at home that incorporates the opportunity cost of time. This revamped price index rises 3.4 percent annually, i.e. by more than the rise in the price of meals out. In other words, meals out became cheaper than meals in, *once the time cost is accounted for*, thereby explaining the fall in time spent cooking.

4.4.3 Impact of work-related costs on income and/or poverty rates

Many studies trace income trajectories after netting out work-related costs. Comparing two-earner married couples in 2000 to single-earner married couples in 1973, Warren and Tyagi report that "after an average two-income family makes its house payments, car payments, insurance payments and child care payments, they have *less* money left over, *even though they have a second full-time earner in the workplace*" (2003: 51-52). Looking at two-earner couples in a cross section, Short, Shea and Eller (1996) compare a net income measure using the Current Population Survey (CPS) versus the Survey of Income and Program Participation (SIPP). They find that when child care expenses are included, the poverty rate of families with working parents rises from 14.8 to 16.4 percent in the CPS and from 12.1 to 13.3 percent in the SIPP. Focusing on "middle and upper-income two-earner couples" in the 1980-83 Consumer Expenditure Surveys, Hanson and Ooms (1991) find that up to 68 percent of the "second worker's" income is sacrificed to work-related costs, including "payments for housekeeping, dry cleaning, more meals at restaurants, commuting, work clothes, and so on."

Single mothers' income trajectories net of child care costs have also been studied extensively. Zedlewski (2002) presents an "expanded definition of poverty" in which she subtracts out-of-pocket child care expenses and federal taxes from a relatively broad

definition of income (i.e. one that includes income from food stamps and the Earned Income Tax Credit). She uncovers opposing income trends among all families with children and low-income families headed by a single parent; while incomes among all families with children *increased* from 1996 to 1998 on average, it actually *fell* for single-parent families in the bottom quintile by 8 percent. Increased earnings were not sufficient to offset the loss of benefits, out-of-pocket expenses for child care and federal taxes.

In an (unpublished) analysis of single mothers' work-related costs, I find the fall in their poverty rates during the 1990s was less dramatic when these costs are accounted for. Following welfare reform in 1996, single mothers worked for pay at increasing rates. I first imputed a cost of child care (of $3 per hour) for every hour they worked for pay. I then subtracted this cost and all other (non-child care) work-related costs available in the Consumer Expenditure Survey (gas, local public transportation, food away and clothing) from income. Using income alone, poverty rates among single moms fell 10 percentage points between 1990 and 1999. Using the alternative measure of income in which I subtract child care and other work-related costs, I find a 6.5 percentage point drop (Folbre and Ohler 2003).

4.5 Data/sample selection, summary statistics, scale definitions and empirical model

The Consumer Expenditure Survey, collected by the Census Bureau (under contract with the Bureau of Labor Statistics (BLS)), contains two segments: the interview and the diary segment. I employ the interview segment in this essay because it contains clothing, transportation and educational expenditures; it is ideal for constructing proxies

for the child/adult and second adult parameters shown in Table 4.2.[51] I define proxies for both the time and commodity costs of children and the second adult; each one varies with that adult's labor force participation. Each time and commodity cost is expressed as a share of total expenditure per household. The objective behind defining these proxies is to bridge the household production literature and the standard parameter-based equivalence scaling framework; I map each proxy on to the equivalent income framework shown in Table 4.2.

In order to construct two samples, one for 1980 and another for 2000, I employ the following restrictions: households are "complete income reporters," they contain a reference person between the ages of 20 to 60 inclusive, five or fewer children, and have positive food expenditure and positive household income. The number of earners is limited to 1 or 2; that is, teenage children in the samples do not work for pay. Finally, I restrict the analysis to married couples because they are more likely than cohabiting couples to pool income.

4.5.1 Summary statistics

Table 4.4 illustrates the average values of the proxies in Table 4.3 by the number of earners per household. As expected, it shows that two-earner households allocate a greater share of their total budget to both food away and transportation in both years; surprisingly, wives' clothing share of the budget does not follow this pattern. It also shows the magnitude of the difference between the lower-bound (reported) and the upper bound babysitting and day care share of the budget.

[51] The diary survey contains smaller categories of expenditures, such as expenditures on fresh fruit versus canned fruit. (Both surveys contain food away expenditures.)

Table 4.4 Expenditures as a Share of Total Expenditure by Household Type

	HW only		HW w/child<6		HW w/child 6-17		HW w/child>17	
Number of earners:	1	2	1	2	1	2	1	2
food away								
1980	0.037	0.050	0.031	0.035	0.038	0.039	0.030	0.040
2000	0.037	0.042	0.030	0.032	0.034	0.039	0.040	0.039
t-value	0.1	3.0	0.1	1.4	1.6	0.0	-0.6	0.3
woman's clothing								
1980	0.006	0.007	0.006	0.005	0.004	0.004	0.000	0.005
2000	0.007	0.007	0.005	0.005	0.005	0.005	0.010	0.007
t-value	-0.9	0.3	0.6	0.1	-1.3	-2.0	-1.2	-1.0
transportation								
1980	0.133	0.139	0.112	0.131	0.108	0.122	0.100	0.136
2000	0.133	0.152	0.132	0.152	0.129	0.152	0.140	0.172
t-value	0.1	-1.7	-1.7	-2.1	-2.4	-4.8	-1.4	-2.0
babysitting & day care (lower-bound)								
1980	---	---	0.005	0.033	0.002	0.011	0.000	0.000
2000	---	---	0.012	0.040	0.003	0.016	0.000	0.001
t-value	---	---	-3.4	-1.7	-0.8	-3.1	---	-2.6
babysitting & day care (upper-bound)								
1980	---	---	0.002	0.027	0.002	0.025	0.000	0.009
2000	---	---	0.009	0.117	0.015	0.111	0.020	0.076
t-value	---	---	-2.6	-21.7	-4.6	-32.2	-2.0	-10.3
childrens' clothes								
1980	---	---	0.005	0.004	0.017	0.017	0.000	0.004
2000	---	---	0.005	0.005	0.012	0.011	0.000	0.004
t-value	---	---	0.6	-1.2	3.0	4.2	1.6	0.1
education								
1980	---	---	0.003	0.004	0.007	0.010	0.030	0.018
2000	---	---	0.016	0.005	0.013	0.010	0.030	0.018
t-value	---	---	-3.0	-0.7	-2.1	0.0	0.0	-0.1
Source: Author's calculation based on the Consumer Expenditure Surveys, Interview Survey.								

Relative to the reported babysitting and day care expenditures, the corresponding upper-bound values likely provide a more accurate picture. Regardless of child age, the increase in care expenditures among two-earner households surpassed that of one earner households. This is consistent with the idea that dual-earner married couples need to

"outsource" child care more than one-earner households. (Presumably if only one spouse is working for pay, the other one is "freed up" to care for their children; if both are working, the need for child care becomes more acute.) For example, households with one earner and an oldest child under 6 spent zero percent of their budget on care in 1980 and 1 percent on it in 2000. The corresponding values for two-earner households were 3 and 12 percent in 1980 and 2000 respectively.

4.5.2 Scale definitions

I attach three standard scales and three non-standard scales to each household-level observation. The key difference is that all the non-standard scales allow the parameter values to vary over time; the standard scales only allow one variable to vary over time, namely household size. The second and third non-standard scales employ plausible proxies for the rising costs of children and "second adults" working for pay. These proxies vary with the number of children, wives' paid work hours, and the particular commodity and time costs each household faces, measured by household-specific budget shares. The averages of these budget shares are shown in Table 3. A comprehensive list of the scales employed in the subsequent section follows.

Standard scale 1: The per capita scale is: Income / (number of household members).

Standard scale 2: The square root scale is: Income / (number of household members)$^{0.5}$.

Standard scale 3: The National Academy of Science (NAS) is: Income / (number of adults + b(number of children))$^{\theta}$, where b (the child/adult "sharing" parameter) is set to 0.7 and θ, the economies of scale parameter, is set to 0.65.

Scale 4 (non-standard): The Engel scale is: Income / (number of household members)$^{\theta}$,

where θ is 0.296 in 1980 and 0.623 in 2000, an increase of 110 percent. These scale economies parameters, one for 1980 and another for 2000, are calculated from the coefficients of a food expenditure model in Chapter 3. The *increase* in the value of theta over time, from 0.296 to 0.623, represents a *fall* in scale economies over time. (It represents movement closer to the per capita scale, where theta is one, which corresponds to zero scale economies.)

Scale 4 rests on the assumption that the loss of scale economies in general was equal to the loss of scale economies in meal preparation specifically. This is a strong assumption; testing it is beyond the scope of this dissertation. However, other descriptive statistics of household consumption suggest that economies of scale fell in areas of the household other than food expenditure and preparation. Electricity consumption, for example, increased despite the drop in average household size (and the rising energy efficiency of refrigerators); the household consumption of electricity for air conditioning increased 72 percent while that for appliances, electronics and lighting increased 64 percent (US Energy Information Administration 2012).[52] Similarly, the number of cars per 1,000 people increased 13 percent, from 710.7 in 1980 to 800.3 in 2000 (U.S. Department of Transportation 2009).

Scale 5 (non-standard, lower-bound scale): The lower-bound scale is: Income / (1 + A[(woman's clothing, transportation, food away / total expenditure)] + C[0.7 + (children's clothing and education, babysitting and day care / total expenditure)], where A is 1 and C is the number of children in the household. By calibrating household income using direct expenditures rather than scale, this scale is more transparent. One of

[52] Measured in quadrillion BTUs, electricity consumption for air conditioning increased from 0.36 in 1980 to 0.62 in 2001; for appliances, electronics and lighting, it increased from 1.54 to 2.52 during the same period.

the key findings of this study is that the two approaches, i.e. Scales 4 and 5, yield similar results; in other words, the loss of scale from food expenditure and preparation is a reasonable proxy for loss of income due to rising work-related costs during this period.

Scale 6 (non-standard, upper-bound scale): The upper-bound scale is the same as Scale 5, except that I replace actual babysitting and day care expenses with an imputed value. Specifically, for each household with an oldest child age 15 or younger, I multiply the number of hours a mother in that household works for pay by $3 in 1980 and the inflation adjusted equivalent (of $6.27) in 2000.

4.5.3 Empirical Model

I use the following "binary variable interaction specification" in order to uncover changes in equivalent income by family type over time (Stock and Watson 2003: 219). Specifically, four types of equivalent income, Y_i, are regressed on two binary variables (year and household type):

$$Y_i = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 (D_{1i} * D_{2i}),$$

where i = per capita income, square root income; NAS income, Engel income, lower income and upper income; D_1 is a dummy variable for year (0 in 1980; 1 in 2000); D_2 is a dummy variable for presence of children (0 for childless; 1 for parent-headed household).

I run this specification three times, yielding three sets of results, which I refer to as Models 1 through 3 in Table 4.6 below. In each of the three models, childless married couples are the omitted group. In Model 1, "parents" include only households containing married adults living with own children where the oldest child is under 6 years old. In Model 2, "parents" include only those households containing married adults living with own children where the oldest child is between 6 and 17 years old inclusive. In Model 3,

"parents" include only those households containing married adults living with own children where the oldest child is over 17 years old.

In each of the three models, the result of interest is the coefficient on the interaction term, β_3, which is the difference in the effect of being a married parent (rather than childless married couple) in 2000 versus 1980.

4.6 Results: how equivalent income trajectories vary with the presence of children

A branch of the equivalence scaling literature is devoted to measuring the sensitivity of distributional outcomes to equivalence scale assumptions. Buss (1992), for example, explores how the choice of scale used alters the size of the American "middle class" over time. Several studies compare the number and/or composition of the poor over time using various equivalence scales (Treist 1998; Betson and Warlick 1998; Burkhauser, Smeeding and Merz 1996; Buhmann, Rainwater, Schmaus and Smeeding 1988). Scholars compare the growth in overall income inequality by equivalence scaling methodology (Slesnick 2001; Cutler and Katz 1992).[53]

Like those studies, I demonstrate that relative income trajectories are quite sensitive to the equivalence scale employed. Like Wolff (2002), I focus specifically on tracing the growing equivalent income inequality between married parents and (non-elderly) childless married couples.[54] The unique aspect of this essay is my comparison of

[53] In fact, two authors that do *not* demonstrate the sensitivity of their results to the choice of equivalence scale used seem to frame this omission as a weakness. Burkhauser and Poupore (1997) point to a *forthcoming* article while explaining what scale they employ: "Since there is no universally accepted family size-adjusted equivalence scale (see Burkhauser et al. (forthcoming) for a discussion of the sensitivity of different equivalence scales in cross-national comparisons) we derive the equivalence scale used here from the official U.S. poverty thresholds" (1997: 14).

[54] Wolff (2002) finds that, between 1973 and 1994, families with children saw their incomes fall *relative* to those of non-elderly childless families. Median income of the former grew 7 percent

standard and non-standard equivalent income trajectories, where the non-standard trajectories vary with women's labor force participation. The three standard scales include the per capita scale, the square root scale, a scale developed/promoted by the National Academy of Science (which I refer to as NAS). The three non-standard scales include an Engel-based scale (described in Chapter 3), a lower-bound scale and an upper-bound scale.

These results are presented in Table 4.5. The dependent variable is listed in the row heading. Three models are shown along the left-hand side, one per household type. In each of the three models, the omitted group is childless married couples, where the reference person is age 20-60. The result of interest is the interaction term: the change in equivalent income of a particular family type (relative to households without children). I find the values of this interaction term are always more negative for the latter three scales (Engel, lower bound and upper bound) than they are for the first three (standard) scales (per capita, square root and NAS). Since the non-standard scales incorporate proxies for changes in norms over time, this analysis suggests that standard scales understate the deterioration in relative well- being of married parents compared to married childless couples.

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in real terms, whereas median income of the latter grew 27 percent. In contrast, *equivalent* income of the former grew 11 percent in real terms, whereas the equivalent income of the latter grew 19 percent. He attributes the better "performance" of families with children in terms of equivalent income in comparison to median income to the fall in the average number of children per family, from 2.33 to 1.86. (To calculate "equivalent income," he divides pre-tax household income by the official poverty threshold for the appropriate family size and type.)

Table 4.5 Equivalent Income Trajectories Across 6 Scales by Family Type

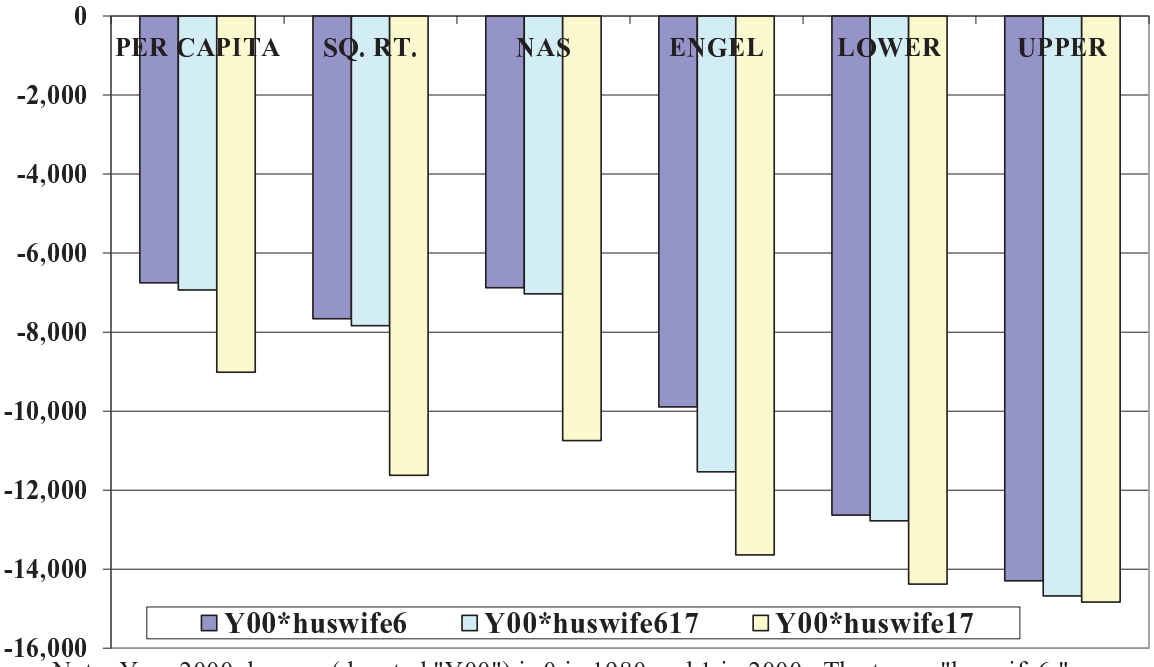
	Per Capita	Sq. Rt.	NAS	ENGEL	LOWER	UPPER
Model 1: oldest child < 6						
Intercept	22,762	32,191	29,012	37,080	38,656	38,656
	33.5	32.0	32.0	38.0	32.1	32.1
y00	11,095	15,690	14,141	6,888	18,868	18,868
	11.9	11.3	11.3	5.1	11.4	11.4
huswife6	-9,797	-8,535	-7,580	-6,788	-18,316	-18,235
	-9.8	-5.8	-5.7	-4.7	-10.3	-10.3
y00*huswife6	-6,753	-7,662	-6,876	-9,891	-12,629	-14,294
	-4.6	-3.5	-3.5	-4.7	-4.9	-5.5
Model 2: oldest child 6-17						
Intercept	22,762	32,191	29,012	37,080	38,656	38,656
	36.8	33.7	33.6	40.2	35.8	36.0
y00	11,095	15,690	14,141	6,888	18,868	18,868
	13.0	11.9	11.9	5.4	12.7	12.8
huswife617	-11,081	-8,872	-8,009	-6,064	-20,745	-20,834
	-13.7	-7.1	-7.1	-5.0	-14.7	-14.8
y00*huswife617	-6,935	-7,835	-7,030	-11,535	-12,773	-14,678
	-6.2	-4.5	-4.5	-6.9	-6.5	-7.5
Model 3: oldest child > 17						
Intercept	22,762	32,191	29,012	37,080	38,656	38,656
	30.3	29.8	30.0	35.5	27.7	27.7
y00	11,095	15,690	14,141	6,888	18,868	18,868
	10.7	10.6	10.6	4.8	9.8	9.8
huswife17	-10,539	-9,205	-9,485	-7,224	-10,852	-10,886
	-5.8	-3.6	-4.1	-2.9	-3.2	-3.3
y00*huswife17	-9,015	-11,625	-10,747	-13,640	-14,376	-14,832
	-3.8	-3.4	-3.5	-4.1	-3.2	-3.3

Note: Year 2000 dummy (denoted "Y00") is 0 in 1980 and 1 in 2000. The terms "huswife6," "huswife617" and "huswife17" refer to married couples with an oldest child under 6, between 6 and 17 and older than 17 respectively.
T-values are shown below coefficients.
In each model (1-3), the omitted group is childless married couples.

Chart 4.2 below depicts each of the interaction terms shown in Table 4.5. Scales depicted with the shortest bars are those that understate the deterioration in relative well-being of married parents, relative to childless married couples, the most. Clearly the worst offenders in this regard, among the standard scales, are the per capita scale and

NAS scales. Among the non-standard scales, the lower-bound scale falls between the Engel and upper-bound scales. The overarching message in Chart 4.2 is that inertia should not continue to drive the use of outdated scaling methodologies; all three non-standard scales indicate that married parents' relative economic situation has deteriorated much more than standard scales indicate.

Chart 4.2 Equivalent Income Across 6 Scales by Family Type, 1980 vs. 2000



Note: Year 2000 dummy (denoted "Y00") is 0 in 1980 and 1 in 2000. The terms "huswife6," "huswife617," and "huswife17" refer to married couples with an oldest child under 6, between 6 and 17 and older than 17 respectively.

4.7 Conclusion

Economies of scale are not simply a function of household size and composition, as standard equivalence scaling techniques (based on Engel's early framework) suggest; they are also affected by the ways that households trade nonmarket work (i.e. "household production") and market substitutes. During the 1980s and 1990s, families increasingly purchased market substitutes for household production. However, empirical studies of

relative well-being disregard the role that household production plays in producing it. They accomplish this by relying on fixed-parameter equivalence scales. The implicit assumption of these scales is that three variables remain fixed over time: (a) the relative cost of adults and children; (b) the relative cost of the second adult; and (c) the scale economies from household production.

In this essay, I explore the implications of these implicit assumptions. I compare equivalent income trajectories of parents and non-parents across six scales: three standard (fixed-parameter) scales and three non-standard scales that allow the parameter values to vary by year. I find that all three standard equivalence scales (the per capita scale, the square root scale and the NAS scale) portray less deterioration in married parents' economic position, relative to their childless counterparts, than alternatives based on plausible assumptions regarding the implications of increases in married mothers' paid employment for household income equivalence measures.

This discussion does not imply that married families with children did not benefit from technological change and outsourcing over this period, along with other families. These factors surely contributed to an overall improvement in living standards. The point, rather, is that declining economies of scale likely increased the marginal cost of additional household members—typically children—relative to the average. As a result, the relative standard of living of married couples with children declined, relative to that of married couples without children. The take-away message is that scholars of relative income trajectories should eschew fixed-parameter equivalence scales. They should instead calibrate household income such that it reflects changes in (a) the relative cost of

adults and children; (b) the relative cost of the second adult; and/or (c) the scale economies from household production.

CHAPTER 5

CONCLUSION

This dissertation examines the changing relationship between food expenditure, household income and household size/composition during a period of social, economic and technological change; the rise in mothers' labor force participation, the fall in the price of food relative all else less food and the technological advances in the prepared food industry have increased the extent to which households trade nonmarket work (i.e. "household production") for market substitutes.

Chapter 2 invokes Gronau's household production theory by framing meal choice in terms of *fixed* time costs associated with meals in (e.g. grocery shopping, cooking and cleaning) versus *variable* money costs of the ingredients. Demand for convenience in meals represents, implicitly, willingness to forego the economies of scale that arise from paying the fixed time costs of eating in. In other words, demand for convenience is the opposite of demand for economies of scale from the household production of meals.

I parse food expenditures into three categories: unprocessed food for use at home, prepared food for use at home and meals out. This disaggregation allows me to explore whether demand for convenience varies by presence of children; relative to meals out, prepared foods might be more convenient for households with children while the opposite might be true for households without children. The main marginal effect of interest is that households with children did increasingly rely on prepared foods; the income elasticity of demand, however, shows that the income effect swamps this child effect when income and presence of children are "interacted." That is, prepared food remains an "inferior" good among households with children, as was the case for households

without them.

Chapter 3 revisits a question about intra-household well-being comparisons that has been debated for over one hundred years: Can household budget data speak to a specific component of well-being, namely the capacity to harness economies of scale? The food share of the budget is unique because it falls in the middle of the spectrum of completely private goods (like transportation and clothing) and completely public goods (like housing). The extent to which food is more public or private depends on whether its preparation is outsourced; the less it is outsourced, the more public it is and the more scale can be harnessed. Five out of six Engel curve models indicate that economies of scale from meals fell during this period.

Chapter 4 explores a related controversial topic that has also been debated by economists for over one hundred years: How should household income be calibrated so that it reflects the costs of children to parents? I answer this question using three steps. First, I bridge two silos: the parameter-based equivalence scaling literature and the household production literature. I argue that conventional equivalence scales ignore changes in both household economies of scale and the relative costs of adults and children over time. Second, I construct plausible, transparent time-varying values for the effects of household composition on living standards, based on consideration of the social, economic and technological changes described above. Third, I contrast equivalent income trajectories across standard and non-standard scales; I present plausible lower- and upper-bound estimates of the understatement of the deterioration in parents' equivalent income relative to that of their childless counterparts.

This sensitivity analysis does not show conclusively that conventional estimates are biased, or that the modified assumptions applied here are accurate. However, it does clearly illustrate the consequences of the conventional assumption that the costs of children are relatively low and constant over the period. Given extensive empirical evidence that these costs rose over time, as mothers reallocated time from non-market work to paid employment, it seems likely that equivalence scales based on conventional assumptions overstate the relative well-being of parents in 2000.

APPENDIX A

FOOD CATEGORIES: PREPARED, UNPROCESSED AND AWAY

Consumer Expenditure Survey (CES) Diary Data: Author's Food Categories Using Universal Classification Codes (UCCs)*			
1980		**2000**	
	Prepared Foods		
100410	Ice Cream & Related Products	100410	Ice cream & related products, including frozen yogurt
180110	Soup	180110	Soup
180210	Frozen Meals	180210	Frozen Meals
180220	Froz/Prep. Food Other Than Meals	180220	Froz/Prep. Food Other Than Meals
180610	Prepared Salads/Desserts	180611	Prepared salads
		180612	Prepared desserts
180710	Misc. Prepared Foods	180710	Misc. Prepared Foods such as canned meats
010210	Cereal	010210	Cereal
010320	Pasta (Dry) And Cornmeal	010320	Pasta, cornmeal, other cereal products
020110	White Bread	020110	White bread
020210	Bread Other Than White	020210	Bread other than white
020310	Fresh Biscuits, Rolls, Muffins	020310	Fresh biscuits, rolls, muffins
020410	Cakes And Cupcakes	020410	Cakes and cupcakes, fresh and other, excluding frozen
020510	Cookies	020510	Cookies, excluding refrigerated dough
020610	Crackers	020610	Crackers, excluding crumbs
020620	Bread And Cracker Products	020620	Bread and cracker products
020710	Doughnuts, Sweetrolls, Coffeecake	020710	Doughnuts, sweet rolls, coffeecakes, fresh & other, excluding frozen
020810	Frozen & Refrig. Bakery Prod.	020810	Frozen refrigerated and canned bakery products, such as biscuits, rolls, muffins, cakes, cupcakes, doughnuts, pies, tarts, turnovers, & miscellaneous products (e.g.batter)
020820	Fresh Pies, Tarts, Turnovers	020820	Pies, tarts, turnovers, fresh and other, excluding frozen
150110	Candy And Chewing Gum	150110	Candy and chewing gum

160310	Non-Dairy Cream Substitutes	160310	Non-dairy cream substitutes
160320	Peanut Butter	160320	Peanut butter
180310	Potato Chips & Other Snacks	180310	Potato chips & other snacks
180320	Nuts	180320	Nuts
180420	Olives, Pickles, Relishes	180420	Olives, pickles, relishes
180510	Sauces And Gravies	180510	Sauces and gravies
180520	Other Condiments	180520	Other condiments
180620	Baby Food	180620	Baby food
Prepared (Non-Alcoholic) Drinks			
130210	Fresh/Canned/Bottled Fruit Juice	130211	Fresh fruit juices
		130212	Canned/bottled fruit juices
170110	Cola Drinks	170110	Cola drinks
170210	Other Carbonated Drinks	170210	Other carbonated drinks
170510	Noncarb. Fruit Flavored Drinks	170510	Noncarbonated fruit flavored drinks, including lemonade-non frozen
170530	Other Noncarb. Beverages	170530	Other noncarbonated beverages & ice, excluding coffee & tea
Raw Foods			
010110	Flour	010110	Flour
010120	Prepared Flour Mixes	010120	Prepared flour mixes
010310	Rice	010310	Rice
030110	Ground Beef Exclude Canned	030110	Ground beef, excluding canned
030210	Chuck Roast	030210	Chuck roast, excluding canned
030310	Round Roast	030310	Round roast, excluding canned
030410	Other Roast	030410	Other beef roast, excluding canned
030510	Round Steak	030510	Round steak, excluding canned
030610	Sirloin Steak	030610	Sirloin steak, excluding canned
030710	Other Steak	030710	Other steak, excluding canned
030810	Other Beef (Exclude Canned)	030810	Other beef, excluding canned
040110	Bacon	040110	Bacon
040210	Pork Chops	040210	Pork chops
040310	Ham (Exclude Canned)	040310	Ham, excluding canned
040410	Other Pork	040410	Other pork, excluding

			canned
040510	Pork Sausage	040510	Pork sausage, excluding canned
040610	Canned Ham	040610	Canned ham
050110	Frankfurters	050110	Frankfurters, excluding canned
050210	Bologna, Liverwurst, Salami	050210	Bologna, liverwurst, salami, excluding canned
050310	Other Lunchmeat	050310	Other lunchmeat
050410	Lamb & Organ Meats	050410	Lamb & organ meats, excluding canned
050900	Mutton, Goat, Game	050900	Mutton, goat, game
060110	Fresh Whole Chicken	060110	Fresh and frozen whole chicken
060210	Fresh Or Frozen Chicken Parts	060210	Fresh or frozen chicken parts
060310	Other Poultry	060310	Other poultry
070110	Canned Fish And Seafood	070110	Canned fish, seafood and shellfish
070210	Fresh And Frozen Shellfish	070230	Fresh fish and shellfish
070220	Fresh And Frozen Fish	070240	Frozen fish and shellfish
080110	Eggs	080110	Eggs
090110	Fresh Whole Milk	090110	Fresh milk all types
090210	Other Fresh Milk And Cream	090210	Cream
100110	Butter	100110	Butter
100210	Cheese	100210	Cheese
100510	Other Dairy Products	100510	Other dairy products, including powdered milk, and fresh, canned and non-frozen yogurt
110110	Apples	110110	Apples
110210	Bananas	110210	Bananas
110310	Oranges	110310	Oranges
110410	Other Fresh Fruits	110410	Other fresh fruits
120110	Potatoes	120110	Potatoes
120210	Lettuce	120210	Lettuce
120310	Tomatoes	120310	Tomatoes
120410	Other Fresh Vegetables	120410	Other fresh vegetables
130110	Frozen Orange Juice	130110	Frozen orange juice
130120	Frozen Fruit, Oth. Fruit Juice	130121	Frozen fruits
		130122	Frozen fruit juices
130310	Canned And Dried Fruit	130310	Canned fruits
		130320	Dried fruits
140110	Frozen Vegetables	140110	Frozen vegetables

140210	Canned Beans	140210	Canned beans
140220	Canned Corn	140220	Canned corn
140310	Other Processed Vegetables	140230	Miscellaneous canned vegetables, not collected in a separate UCC
		140310	Other processed dried vegetables, such as squash, not collected in a separate UCC
		140320	Dried peas
		140330	Dried beans
		140340	Dried carrots, onions, leafy greens, and cabbage
150211	Sugar	150211	Sugar
150212	Artificial Sweeteners	150212	Artificial sweeteners
150310	Other Sweets	150310	Jams, preserves & other sweets
160110	Margarine	160110	Margarine
160210	Oth Fats/Oils/Salad Dressings	160211	Fats and oils
		160212	Salad dressings
170310	Roasted Coffee	170310	Coffee, roasted
170410	Instant/Freeze Dried Coffee	170410	Coffee, instant or freeze dried
170520	Tea	170520	Tea
180410	Salt/Other Seasonings & Spices	180410	Salt, other seasonings & spices
	Food Away		
190110	Lunch	190111	Lunch at Fast Food
		190112	Lunch at Full Service
190210	Dinner	190211	Dinner at Fast Food
		190212	Dinner at Full Service
190310	Snacks And Non Alcoholic Bev.	190311	Snacks at Fast Food
		190312	Snacks at Full Service
190320	Breakfast And Brunch	190321	Breakfast at Fast Food
		190322	Breakfast at Full Service
*Note: The distinction between prepared and raw food is made by the author; the BLS includes both of these categories in "food at home."			

APPENDIX B

ADDRESSING HETEROSKEDASTICITY AND RELATIVE PRICE SHIFTS

Multivariate regression models isolate the relative importance of the many factors driving food budget allocations. However, the study of food consumption poses two specification problems: heteroskedasticity (Griffith, Hill and Judge 1993) and relative price shifts (Kokoski 1986).

Cross-sectional food expenditure data is generally heteroskedastic. That is, in a model of food expenditure as a function of income, the standard errors are characterized by non-constant variance. Regression analysis of heteroskedastic data produces biased standard errors; biased errors increase the odds of making a so-called Type 1 Error when interpreting the regression results.[55] Two ways to reduce or eliminate the risk of making a type 1 error are the following:

1. Estimate models with weighted least squares (WLS) rather than ordinary least squares (OLS).[56] Relative to OLS, WLS yields more reliable estimates when heteroskedasticity is present (Lee and Brown 1986); that is, standard errors are generally *lower* in the WLS case (which in turn yield *higher* t-values) than in the OLS case.

2. Use share forms of the expenditure variable (e.g. food as a share of total expenditure), rather than expenditure (e.g. food) itself: "We use the share forms because they involve less heteroskedasticity than expenditure forms" (Pollack and Wales 1992:145).

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[55] A type 1 error occurs when a statistical test leads a researcher to reject a true null hypothesis.

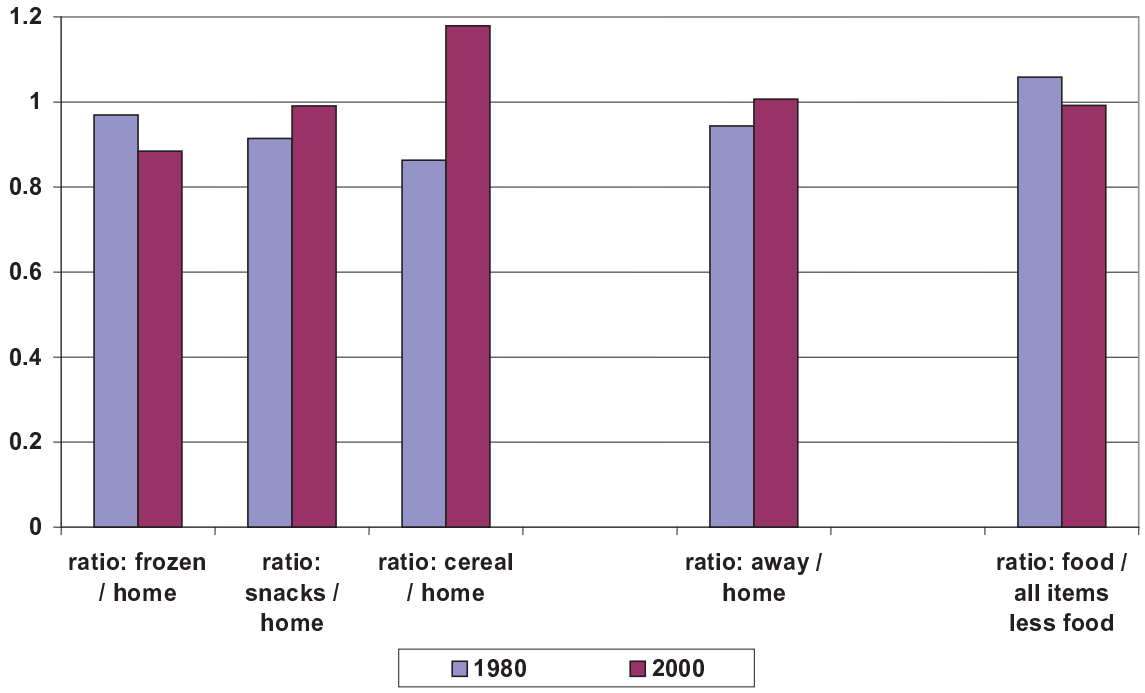
[56] WLS weights the regression model by the inverse of household income (Griffiths, Hill and Judge 1993).

Two relative-price trends appear in the chart below. First, the relative price of prepared foods and all food at home varies by good.[57] To see this, note that the first three sets of bars move in different directions over time. Second, two price shifts offset one another, namely that of food away relative to food at home and that of food relative to all non-food items. To see this, compare the second and third set of bars. While the price of food away relative to food at home jumped, the price of all food relative to all items less food fell by roughly the same amount.[58] Given that these two ratios moved in opposite directions, they could potentially cancel each other out; the rising price of meals out relative to meals in may have been offset by the falling price of food relative to all else.

[57] The three prepared items shown in Chart B were selected because they increased the most in relative importance (as shown in Table 2).

[58] One explanation for the fact that the CPI for food is generally less than that for all items (roughly during the period under consideration) follows: "economies of size in the farm sector have kept per unit production cost increases relatively low. For example, the number of farms (any establishment from which $1,000 or more agricultural products were sold or would normally be sold during the year) fell from 2.8 million in 1974 to 2.1 million in 1996, while the average farm size increased from 384 to 469 acres" (Economic Research Service, USDA, 1997: 4).

Chart B. Price Ratios



Controlling for relative price shifts within an econometric model is difficult for two reasons. First, data availability precludes a highly-detailed comparison. That is, CPIs for *prepared* foods are not available by region; regional food-related CPI data is only available for food away and food at home. Second, the inclusion of a single (nation-wide) inflation index would be perfectly correlated with the year dummies in the regression models (Hamilton 1998). I resolve this issue by taking advantage of geographic variation in relative prices provided by the BLS.[59] Like Kokoski (1986), I assign each household the following two relative price ratios based on their region and the year in which their expenditure diary was completed: (price index for food away) / (price index for food at home) and (price index for all food) / (price index for all items less food).

[59] Nelson (1988) also assigns regional price variables to Consumer Expenditure Survey data.

APPENDIX C

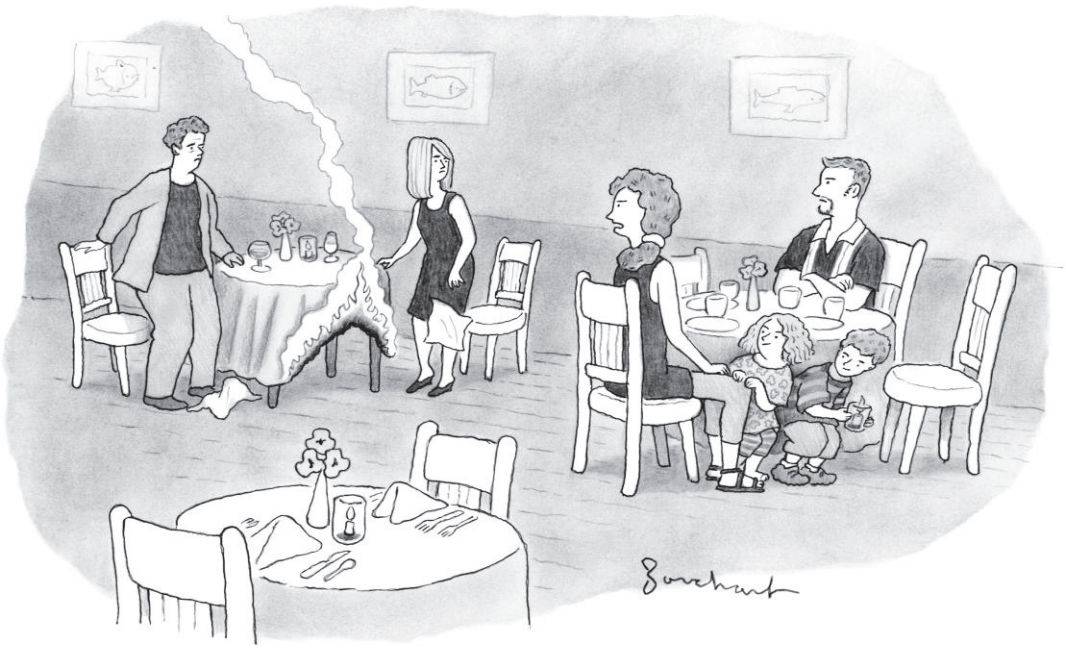
PER CAPITA FOOD EXPENDITURE USING A "LINEAR IN VARIABLES"

FUNCTIONAL FORM (WLS)

Dependent variable: (food expenditure / household size)						
Note: household is abbreviated "hh" below.						
	Model 1		Model 2		Model 3	
	1980	2000	1980	2000	1980	2000
Intercept	44.49	35.43	42.12	36.73	75.12	92.68
	38.2	41.1	27.3	35.2	1.9	5.1
(Weekly income / hh size)	0.08	0.08	0.08	0.07	0.08	0.07
	22.1	32.5	20.3	29.3	19.2	28.0
Household size	-5.08	-3.33	-6.19	-3.54	-6.67	-3.93
	-10.2	-9.5	-9.8	-8.6	-10.4	-9.4
Number of babies / hh size	-14.13	-18.19	-10.44	-15.24	-9.27	-12.92
	-3.6	-7.1	-2.5	-5.6	-2.2	-4.7
Number of children / hh size	-5.25	-6.42	2.74	-4.60	3.99	-2.90
	-1.6	-2.8	0.8	-1.9	1.1	-1.2
Number of 16 & 17 yr olds / hh size	6.16	-12.28	10.25	-9.37	10.08	-8.27
	0.9	-2.8	1.5	-2.1	1.4	-1.9
LN (woman's paid hours per week)			-0.77	-2.52	-0.39	-2.37
			-1.0	-4.3	-0.5	-4.0
LN (woman's paid weeks per year)			0.35	2.01	0.07	1.98
			0.5	3.6	0.1	3.5
College+ (woman)			-1.04	-0.30	-2.14	-0.64
			-0.8	-0.3	-1.7	-0.7
LN (man's paid hours per week)			2.99	-2.39	2.75	-2.89
			3.3	-2.8	3.0	-3.4
LN (man's paid weeks per year)			-1.33	1.95	-1.23	2.30
			-1.5	2.4	-1.4	2.8
College+ (man)			2.79	3.52	2.86	3.58
			2.1	3.3	2.1	3.3
Woman's age			0.05	-0.02	0.03	-0.04
			1.3	-0.8	0.9	-1.4
Homeowner (1=own; 0=rent)					2.22	2.57
					1.7	2.9
Ratio: food CPI / all non-food items CPI					-161.59	1.98
					-5.0	0.1
Ratio: food away CPI / food at home CPI					149.15	-56.18
					2.6	-5.2
R squared	0.30	0.28	0.32	0.29	0.33	0.30
Note: Values below coefficients are T-statistics.						

APPENDIX D

CARTOONS ABOUT CHILDREN IN RESTAURANTS



"Kids burn things—if you don't like it, don't go out."
David Borchart/The New Yorker/www.cartoonbank.com

"With four or more kids' meals, you get a shot of bourbon."
Danny Shanahan/The New Yorker/www.cartoonbank.com

BIBLIOGRAPHY

Albelda, Randy. 2011. "Time Binds: US Antipoverty Policies, Poverty and the Well-Being of Single Mothers." *Feminist Economics* 17(4): 189-214.

Anderson, Heather and Farshid Vahid. 1997. "On the Correspondence Between Individual and Aggregate Food Consumption Functions: Evidence from the USA and the Netherlands." *Journal of Applied Econometrics* 12(5): 477-507.

Atkinson, A.B. 1983. *The Economics of Inequality*. Oxford: Clarendon Press.

Barten, A.P. 1964. "Family Composition, Prices and Expenditure Patterns," in P.E. Hart et al., eds., *Econometric Analysis for National Economic Planning*. London.

Becker, Gary. 1981. *A Treatise on the Family*. Cambridge: Harvard University Press.

Bee, Adam, Bruce Meyer and James Sullivan. 2012. "The Validity of Consumption Data: Are the Consumer Expenditure Interview and Diary Surveys Informative?" National Bureau of Economic Research. Available at: http://www.nber.org/chapters/c12662.pdf.

Bellante, Don and Ann Foster. 1984. "Working Wives and Expenditures on Services." *The Journal of Consumer Research* 11(2): 700-707.

Benus, J., J. Kmenta and H. Shapiro. 1976. "The Dynamics of Household Budget Allocation to Food Expenditures." *The Review of Economics and Statistics* 58(2): 129-138.

Betson, David. 2001. "Estimating the Relative Poverty Status of Children and Elderly Using a Comprehensive Measure of Poverty," in Amitava Dutt and Kenneth Jameson, eds. *Crossing the Mainstream: Ethical and Methodological Issues in Economics*, Notre Dame Press.

---. 2004. "Poverty equivalence sales: Adjustment for demographic differences across families," Presented at the 2004 National Academy of Science Conference. Available at: http://www7.nationalacademies.org/cnstat/Poverty_Equivalence_Scales_Betson_Paper_PDF.pdf.

---. 1996. "Is Everything Relative? The Role of Equivalence Scales in Poverty Measurement." Available at: http://aspe.hhs.gov/poverty/papers/escale.pdf

--- and Jennifer Warlick. 1998. "Alternative Historical Trends in Poverty." *The American Economic Review* 88(2): 348-351.

Bojer, Hilde and Julie Nelson. 1999. "Equivalence Scales and the Welfare of Children: A Comment on 'Is There Bias in the Economic Literature on Equivalence Scales?'" *Review of Income and Wealth* 45(4): 531-534.

Brandon, Hembree. “Competition helping hold down food price inflation.” *Farm Press*. March 4, 2004.

Browning, Martin and Costas Meghir. 1991. “The effects of male and female labor supply on commodity demands.” *Econometrica* 59(4): 925-951.

Brown, Alan and Angus Deaton. 1972. “Surveys in Applied Economics: Models of Consumer Behaviour.” *The Economic Journal* 82(328): 1,145-1,236.

Bryant, W. Keith and Cathleen D. Zick. 2006. *The Economic Organization of the Household*. Second Edition. Cambridge University Press.

--- and Yan Wang. 1990. “American Consumption Patterns and the Price of Time: A Time-Series Analysis.” *The Journal of Consumer Affairs* 24(2): 280-306.

Buckley, Cara. “City Refines Formula to Measure Poverty Rate.” *The New York Times*. July 14, 2008.

Buhmann, Brigitte, Lee Rainwater, Guenther Schmaus and Timothy Smeeding. 1988. “Equivalence Scales, Well-Being, Inequality and Poverty: Sensitivity Estimates Across Ten Countries Using the Luxembourg Income Study (LIS) Database.” *Review of Income and Wealth* 34: 115-142.

Bunkers, E.W. and Willard Cochrane. 1957. “On the Income Elasticity of Food Services.” *The Review of Economics and Statistics* 39(2): 211-217.

Bureau of Labor Statistics. 2007. The Consumer Price Index. Bureau of Labor Statistics. Available online at: http://www.bls.gov/opub/hom/pdf/homch17.pdf.

Burkhauser, Richard, Timothy Smeeding and Joachim Merz. 1996. “Relative Inequality and Poverty in Germany and the United States Using Alternative Equivalence Scales.” *Review of Income and Wealth* 42(4): 381-400.

--- and John Poupore. 1997. “A Cross-National Comparison of Permanent Inequality in the United States and Germany.” *The Review of Economics and Statistics* 79(1): 10-17.

Buse, Reuben. 1987. “Socioeconomic, Demographic and Psychological Variables in Demand Analysis,” in Robert Raunikar and Chung-Liang Huang, eds. *Food Demand Analysis: Problems, Issues and Empirical Evidence*, pp. 186-215. Ames: Iowa State University Press.

Buss, James. 1992. “Household Economies of Scale and Changes in the Distribution of Income: The Declining Middle Segment.” *American Journal of Economics and Sociology* 51(3): 305-316.

Byrne, Patrick, Oral Capps and Atanu Saha. 1996. "Analysis of Food-Away-From-Home Expenditure Patterns for US Households, 1982-89." *American Journal of Agricultural Economics* 78(3): 614-27.

---. 1998. "Analysis of Quick-serve, Mid-scale and Up-scale Food Away from Home Expenditures." *International Food and Agribusiness Management Review* 1(1): 51-72.

Cage, Robert. Personal communication via email. August 15, 2012

Capps, Oral and Joseph Havlicek. 1987. "Concepts of Consumer Demand Theory," in Robert Raunikar and Chung-Liang Huang, eds. *Food Demand Analysis: Problems, Issues and Empirical Evidence*, pp. 3-32. Ames: Iowa State University Press.

---, John Tedford and Joseph Havlicek. 1985. "Household Demand for Convenience and Non-Convenience Foods." *American Journal of Agricultural Economics* 67(4): 862-69.

Cascio, Elizabeth. 2006. "Public Preschool and Maternal Labor Supply: Evidence from the Introduction of Kindergartens in American Public Schools." University of Kentucky Center for Poverty Research Discussion Paper Series #2006-05. Available at: http://www.ukcpr.org/Publications/DP2006-05.pdf.

Citro, Constance and Robert Michael. 1995. *Measuring Poverty: A New Approach.* Washington, DC: National Academy Press.

Cohen, Philip. 1998. "Replacing Housework in the Service Economy: Gender, Class and Race-Ethnicity in Service Spending." *Gender and Society* 12(2): 219-31.

Crossley, Thomas and Yuqian Lu. 2004. "Exploring the Returns to Scale in Food Preparation. (Baking Penny Buns at Home)." The Institute for Fiscal Studies. Available at: http://www.ifs.org.uk/wps/wp0503.pdf.

Cutler, David, Edward Glaeser and Jesse Shapiro. 2003. "Why Have Americans Become More Obese?" *Journal of Economic Perspectives* 17(3): 93-118.

--- and Lawrence Katz. 1992. "Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980's." *The American Economic Review* 82(2): 546-551.

Davis, David and Hayden Stewart. 2002. "Changing Consumer Demands Create Opportunities for U.S. Food System." *Food Review*. Economic Research Service. USDA. Available at: http://www.ers.usda.gov/publications/FoodReview/May2002/frvol25i1d.pdf.

Deaton, Angus and Christina Paxson. 1998. "Economies of Scale, Household Size and the Demand for Food." *Journal of Political Economy* 106(5): 897-930.

Deaton, Angus. 1997. *The Analysis of Household Surveys:. A Microeconomic Approach to Development Policy*. Johns Hopkins University.

---. 1986. "Demand Analysis," in Zvi Griliches and Michael Intriligator, eds. *Handbook of Econometrics, Volume 3*, pp. 1,767-1,839. Elsevier.

--- and John Muellbauer. 1980. *Economics and Consumer Behavior*. Cambridge University Press.

Douglas, Susan P. 1976. "Cross-National Comparisons and Consumer Stereotypes: A Case Study of Working and Non-Working Wives in the U.S. and France." *Journal of Consumer Research* 3(1): 12-20.

Economic Research Service, United States Department of Agriculture (USDA). 2008. "Sales of Meals and Snacks Away from Home by Type of Outlet." Available at: http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/table17.htm.

---. 2007. *Who Has Time to Cook? How Family Resources Influence Food Preparation.* Economic Research Report Number 40. Available at: http://www.ers.usda.gov/publications/ERR40/err40.pdf.

---. 2004. *The Demand for Food Away from Home: Full-Service or Fast Food?* United States Department of Agriculture. Agricultural Economic Report No. 829. Available at: http://www.ers.usda.gov/publications/aer829/aer829.pdf.

---. 1997. "Economic Factors Holding Down Food Price Increases." *Food Review*, Economic Research Service, United States Department of Agriculture. Available at: http://www.ers.usda.gov/publications/foodreview/aug1997/may97a.pdf.

---. Food Availability (Per Capita) Data System. Economic Research Service, United States Department of Agriculture. Available at: http://www.ers.usda.gov/Data/FoodConsumption.

Engel, Ernst. 1857. "Die productions- und consumtionsverhältnisse des Königreichs Sachsen," in Ernst Engel, *Die lebenkosten belgischer arbeiter-familien*, Dresden, 1895, C. Heinrich.

Ferreira, M. Luisa, Reuben C. Buse and Jean-Paul Chavas. 1998. "Is There Bias In Computing Household Equivalence Scales?" *Review of Income and Wealth* 44(2): 183-197.

Folbre, Nancy. 2008. *Valuing Children: Rethinking the Economics of the Family*. Harvard University Press.

---. and Tami Ohler. 2003. “Employment Costs and Poverty Measurement: Did Poverty Among Mothers Really Fall in the 1990s?” Presented at the 14th Annual Conference of the International Association for Feminist Economics.

Gan, Li and Victoria Vernon. 2003. “Testing the Barten Model of Economies of Scale in Household Consumption: Toward Resolving a Paradox of Deaton and Paxson.” *Journal of Political Economy* 111(6): 1,361-1,377.

Garfinkel, Irwin and Robert Haveman. 1977. *Earnings Capacity, Poverty and Inequality*. New York: Academic Press.

Gold, B. 1981. “Changing perspectives on size, scale and returns: an interpretive survey.” *Journal of Economic Literature* 19: 5-33.

Gordon, Robert and Zvi Griliches. 1997. “Quality Change and New Products.” *The American Economic Review* 87(2): 84-88.

Gramm, Wendy Lee. 1974. “The Demand for the Wife’s Non-Market Time.” *Southern Economic Journal* 41(1): 124-133.

Gray, Maureen Boyle. 1992. “Consumer Spending on Durables and Services in the 1980’s.” *Monthly Labor Review*. Bureau of Labor Statistics.

Greenberg, Mark. 2005. Testimony before the Committee on Education and the Workforce, US House of Representatives. *Center for Law and Social Policy*. Available at: http://www.clasp.org/admin/site/publications_archive/files/0174.pdf.

Griffiths, William, R. Carter Hill and George Judge. 1993. *Learning and Practicing Econometrics*. John Wiley and Sons, Inc.

Gronau, Reuben. 1977. “Leisure, Home Production, and Work—the Theory of the Allocation of Time Revisited.” *The Journal of Political Economy* 85(6): 1,099-1,124.

Hamilton, Bruce. 1998. *The True Cost of Living: 1974-1991*. Johns Hopkins University Working Paper.

Hanson, Sandra and Theodora Ooms. 1991. “The Economic Costs and Rewards of Two-Earner, Two-Parent Families.” *Journal of Marriage and the Family* 53: 622-634.

Haque, M. Ohidul. 2005. *Income Elasticity and Economic Development: Methods and Applications*. Springer.

Heckman, James. 1980. “Sample Selection Bias As a Specification Error.” *Female Labor Supply: Theory and Estimation*. ed. James P. Smith. Princeton, NJ: Princeton University Press.

Hofferth, Sandra. 1996. “Child Care in the United States Today.” *The Future of Children* 6(2): 41-61.

Horton, Susan and Cathy Campbell. 1991. “Wife’s Employment, Food Expenditures and Apparent Nutrient Intake: Evidence from Canada.” *American Journal of Agricultural Economics* 73(3): 784-794.

Institute of Food Technologists. 2000. “A Century of Food Science.” Available at: http://www.ift.org/knowledge-center/learn-about-food-science/what-is-food-science/~/media/PDF/A_Century_of_Food_Science_web.pdf.

Jackson, Maggie. 2009. *Distracted: the erosion of attention and the coming dark age*. Prometheus Books.

Jacobs, Eva, Stephanie Shipp and Gregory Brown. 1989. “Families of working wives spending more on services and non-durables.” *Monthly Labor Review*: 15-23.

Jacobsen, Joyce. 1994. *The Economics of Gender*. Wiley-Blackwell.

Jekanowski, Mark, James Binkley and James Eales. 2001. “Convenience, Accessibility and the Demand for Fast Food.” *Journal of Agricultural and Resource Economics* 26(1): 58-74.

---. 1999. “Grocery Industry Courts Time-Pressed Consumers with Home Meal Replacements.” Economic Research Service.

--- and James Binkley. 2000. “Food Purchase Diversity Across US Markets.” Agribusiness 16(4): 417-433. Available at: http://ddr.nal.usda.gov/bitstream/10113/34134/1/IND22301460.pdf.

Jenkins, Stephen. 1991. “Poverty Measurement and the Within-Household Distribution: Agenda for Action.” *Journal of Social Policy* 20(4): 457-483.

--- and Frank Cowell. 1994 “Parametric Equivalence Scales and Scale Relativities.” *The Economic Journal* 104(425): 891-900.

Johnson, David, Timothy Smeeding and Barbara Boyle Torrey. 2005. “Economic inequality through the prisms of income and consumption.” *Monthly Labor Review* (April): 11-24.

---. 1998. “Equivalence scales and the distribution of well-being across and within households,” in Stephen Jenkins, Arie Kapeteyn and Bernard M.S. Van Praag, eds *The Distribution of Welfare and Household Production*, Cambridge University Press.

---. 1996. "The Two-Parameter Equivalence Scale and Inequality Between and Within Households." Prepared for the 24th General Conference of the International Association for Research in Income and Wealth.

Johnson, Terry and John Pencavel. 1980. "Welfare Payments and Family Composition," in Philip Robins, ed *A Guaranteed Annual Income: Evidence From A Social Experiment*, pp. 223-240. New York: Academic Press.

Jorgenson, Dale. 1997. *Welfare, Volume 1: Aggregate Consumer Behavior*. The MIT Press.

--- and Daniel Slesnick. 1987. "Aggregate Consumer Behavior and Household Equivalence Scales." *Journal of Business and Economic Statistics* 5(2): 219-232.

Juster, F. Thomas and Frank P. Stafford. 1991. "The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement." *Journal of Economic Literature* 29(2): 471-522.

Kashtock, Michael E. 1988. "New Packaging for Processed Foods: Opportunities and Challenges," in J. Hotchkiss, ed. *Food and Packaging Interactions*. Washington, DC: American Chemical Symposium Series, American Chemical Society.

Kimmel, Jean and Rachel Connelly. 2007. "Mothers' Time Choices: Caregiving, Leisure, Home Production and Paid Work." *The Journal of Human Resources* 42(3): 643-681.

Kinnucan, Henry and Benjamin Sexauer. 1978. "The Demand for Home Produced Food by Rural Families." *American Journal of Agricultural Economics* 60(2): 338-344.

Kinsey, Jean and Ben Senauer. 1996. "Consumer Trends and Changing Food Retailing Formats." *American Journal of Agricultural Economics* 78(5): 1,187-1,191.

Kokoski, Mary. 1986. "An Empirical Analysis of Inter-temporal and Demographic Variations in Consumer Preferences." *American Journal of Agricultural Economics* 68(4): 894-907.

Korenman, Sanders. 1988. "Empirical Explorations in the Economics of the Family." Dissertation. Harvard University.

Kuchler, Fred and Hayden Stewart. 2008. "Price Trends are Similar for Fruits, Vegetables and Snack Foods." Economic Research Report, Number 55. U.S. Department of Agriculture. Available at: http://www.ers.usda.gov/publications/err55/err55.pdf.

Landefeld, Steven, Barbara Fraumeni and Cindy Vojtech. 2009. "Accounting for Household Production: A Prototype Satellite Account Using the American Time Use Survey." *Review of Income and Wealth* 55(2): 205–225.

Lanjouw, Jean, Peter Lanjouw, Branko Milanovic and Stefano Paternostro. 2004. "Relative price shifts, economies of scale and poverty during economic transition." *Economics of Transition* 12(3): 509-536.

Lanjouw, Peter, Branko Milanovic and Stefano Paternostro. 1998. "Poverty and Economic Transition: How Do Changes in Economies of Scale Affect Poverty Rates of Different Households?" World Bank Library.

--- and Martin Ravallion. 1995. "Poverty and Household Size." *The Economic Journal* 105(433): 1,415-1,434.

Lazear, Edward and Robert Michael. 1980. "Family Size and Distribution of Real Per Capita Income." *The American Economic Review* 70(1): 91-107.

---. 1988. *Allocation of Income Within the Household*. The University of Chicago Press.

Leamer, Edward. 1997. "Revisiting Tobin's 1950 Study of Food Expenditure." *Journal of Applied Econometrics* 12(5): 533-553.

Lee, Jonq-Ying and Mark Brown. 1986. "Food Expenditures at Home and Away from Home in the United States—A Switching Regression Analysis." *Review of Economics and Statistics* 68(1): 142-147.

Logan, Trevon. 2008. "Economies of Scale in the Household: Puzzles and Patterns from the American Past," National Bureau of Economic Research Working Paper 13869. Available at http://www.econ.ohio-state.edu/trevon/pdf/w13869.pdf.

MacDonald, James. 1995. "Consumer Price Index Overstates Food-Price Inflation." *Food Review*. Economic Research Service, USDA. Available at: http://www.ers.usda.gov/publications/FoodReview/sep1995/foodreview_18_03.pdf. (Last accessed February 23, 2011.)

Magrabi, Frances, Young Sook Chung, Sanghee Sohn Cha and Se-Jeong Yang. 1991. *The Economics of Household Consumption*. New York, NY: Praeger Publishers.

McCaffery, Edward. 1997. *Taxing Women*. The University of Chicago Press.

McCracken, Vicki and Jon Brandt. 1987. "Household Consumption of Food-Away-From-Home: Total Expenditure and by Type of Food Facility." *American Journal of Agricultural Economics* 69(2): 274-284.

Messinger, Paul and Chakravarthi Narasimhan. 1997 "A Model of Retail Formats Based on Consumers' Economizing on Shopping Time." *Marketing Science* 16(1): 1–23.

Michael, Robert and Gary Becker. 1973. "On the New Theory of Consumer Behavior." *The Swedish Journal of Economics* 75(4): 378-396.

Michael, Robert. 1972. "The Effect of Education on Efficiency in Consumption." National Bureau of Economic Research. Available at http://www.nber.org/books/mich72-1.

Morzuch, B., R. D. Weaver and P.G. Helmberger. 1980. "Wheat Acreage Supply Response under Changing Farm Programs." *American Journal of Agricultural Economics* 62(1): 29-37.

Mouchard, Andre. 2003. "Frozen in Time." The Orange County Register.

Nelson, Julie. 1993. "Household Equivalence Scales: Theory versus Policy?" *Journal of Labor Economics* 11(3): 471-493.

---. 1988. "Household Economies of Scale in Consumption: Theory and Evidence." *Econometrica* 56(6): 1,301-1,314.

Nelson, Julie. 2012. Personal Communication.

Nicholson, J.L. 1976. "Appraisal of Different Methods of Estimating Equivalence scales and Their Results." *Review of Income and Wealth* 22: 1-9.

Nicol, Christopher and Alice Nakamura. 1994. "Labor Supply and Child Status Effects on Household Demands." *Journal of Human Resources* 29(2): 588-599.

Park, John and Oral Capps, Jr. 1997. "Demand for Prepared Meals by US Households." *American Journal of Agricultural Economics* 79(3): 814-824.

---, Rodney Holcomb, Kellie Curry-Raper and Oral Capps, Jr. 1996. "A Demand Systems Analysis of Food Commodities by U.S. Households Segmented by Income." *American Journal of Agricultural Economics* 78(2): 290-300.

Paszkiewicz, Laura. 2005. "From AFDC to TANF: Have the New Public Assistance Laws Affected Consumer Spending of Recipients?" *Consumer Expenditure Survey Anthology, US Bureau of Labor Statistics* (Report 981): 31-35.

Pollak, Robert and Terence Wales. 1992. *Demand System Specification and Estimation*. Oxford University Press.

Prais, S. J. and H. S. Houthakker. 1955. *The Analysis of Family Budgets*. Cambridge.

Prochaska, F.J. and R.A. Schrimper. 1973. "Opportunity Cost of Time and Other Socioeconomic Effects on Away from Home Food Consumption." *American Journal of Agricultural Economics* 55(4): 595-603.

Putnam, Judy and Shirley Gerrior. 1999. "Trends in the US Food Supply, 1970-97," in Elizabeth Frazao, ed. *America's Eating Habits: Changes and Consequences*. Agriculture

Information Bulletin No. AIB750. Economic Research Service. Available at: http://www.ers.usda.gov/publications/aib750/aib750g.pdf.

Redman, Barbara. 1980. "The Impact of Women's Time Allocation on Expenditure for Meals Away from Home and Prepared Foods." *American Journal of Agricultural Economics* 62(2): 234-237.

Reid, Margaret. 1934. *Economics of Household Production*. New York: Wiley.

Richards, Timothy, Gao, X.M. and Paul Patterson. 1998 "The Demand for Value-Added and Convenience: A Household Production Approach." *Agribusiness* 14(5): 363-378.

Rothbarth, Erwin. 1943. "Note on a method of determining equivalent income for families of different composition," appendix 4 of C. Madge, ed *War time pattern of saving and spending*, Occasional Paper No.4, London. National Institute of Economic and Social Research.

Rubin, Rose, Bobye Riney and David Molina. 1990. "Expenditure Pattern Differentials between One-Earner and Dual-Earner Households: 1972-73 and 1984." *The Journal of Consumer Research* 17(1): 43-52.

Ruggles, Patricia. 1990. *Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy*. The Urban Institute Press.

Sabelhaus, John and Ulrike Schneider. 1997. "Measuring the Distribution of Well-Being: Why Income and Consumption Give Different Answers." Konjunkturpolitik, 43. Verlag Duncker & Humblot GmbH, Berlin.

Sanchis-Llopis, Juan. 2001. "Infrequency of purchase: A Model for Clothing Consumption with Panel Data." *Annales D'Economie et de Statistique* 61: 49-71.

Schor, Juliette. 2004. *Born to Buy*. Scribner.

Senauer, Ben, David Sahn and Harold Alderman. 1986. "The Effect of the Value of Time on Food Consumption Patterns in Developing Countries: Evidence from Sri Lanka." *American Journal of Agricultural Economics* 68(4): 920-927.

Sexauer, Benjamin. 1979. "The Effect of Demographic Shifts and Changes in the Income Distribution on Food-Away-from-Home Expenditure." *American Journal of Agricultural Economics* 61(5): 1,046-1,057.

Shapiro, Carl and Hal Varian. 1999. *Information rules: a strategic guide to the network economy*. Harvard Business School Press.

Shapiro, Laura. 2004. *Something from the Oven: Reinventing Dinner in 1950s America*. Viking.

Short, Kathleen. 2011. "The Research: Supplemental Poverty Measure: 2010." United States Census Bureau. Available at: http://www.census.gov/hhes/povmeas/methodology/supplemental/research/Short_ResearchSPM2010.pdf (accessed November 1, 2012).

--- , Martina Shea and T.J. Eller. 1996. "Work Related Expenditures in a New Measure of Poverty," Census Bureau Working Paper 219. Available at: http://www.census.gov/sipp/workpapr/wp219.pdf (accessed November 18, 2012).

Singh, Balvir. 1972. "On the determinants of economies of scale in household consumption. *International Economic Review* 13: 257-270.

Slesnick, Daniel T. 2001. *Consumption and Social Welfare: Living Standards and Their Distribution in the United States*. Cambridge University Press.

Smeeding, Timothy and Dennis H. Sullivan. 1998. "Generations and the Distribution of Economic Well-Being: A Cross-National View," *The American Economic Review*, Papers and Proceedings of the Hundred and Tenth Annual Meeting of the American Economic Association 88(2): 254-258.

Stewart, Ken. 2011. Personal Communication.

Stock, James and Mark Watson. 2003. *Introduction to Econometrics.* Pearson Education.

Strober, Myra and Charles Weinberg. 1977. "Working Wives and Major Family Expenditures." *The Journal of Consumer Research* 4(3): 141-147.

Tobin, James. 1950. "A statistical demand function for food in the U.S.A." *Journal of the Royal Statistical Society* Series A, Part II: 113-141.

Triest, Robert. 1998. "Has Poverty Gotten Worse?" *The Journal of Economic Perspectives* 12(1): 97-114.

Tyrell, T.J. and T. D. Mount. 1987. "Analysis of Food and Other Expenditures Using a Linear Logit Model," in Robert Raunikar and Chung-Liang Huang, eds. *Food Demand Analysis: Problems, Issues and Empirical Evidence*, pp. 143-153. Ames: Iowa State University Press.

U.S. Department of Transportation, Federal Highway Administration. 2009. Highway Statistics, Washington, DC.

United States Energy Information and Administration. 2012. Annual Energy Review, Table 2.5. Available at: http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0205.

Van Driel, Hans, Venuta Nadall and Kees Zeelenberg. 1997. "The Demand for Food in the United States and the Netherlands: A Systems Approach with the CBS Model." *Journal of Applied Econometrics* 12(5): 509-523.

Van Imhoff, E. and J.G. Odink. 1992. "Household equivalence scales, the Engel method and the definition of goods," Working paper, University of Amsterdam, Amsterdam.

Van Praag, Bernard and Marcel Warnaar. 1997. "Cost of Children and the Use of Demographic Variables in Consumer Demand," in Mark Rosenzweig and Oded Stark, eds *Handbook of Population and Family Economics*, Volume 1A.

Variyam, Jayachandran. 2005. "The Price is Right: Economics and the Rise in Obesity." *AmberWaves* (a publication of the Economic Research Service, USDA). Available at: http://www.ers.usda.gov/AmberWaves/February05/Features/ThePriceIsRight.htm.

Vernon, Victoria. 2005. *Food Expenditure, Preparation Time and Household Economies of Scale*. Available at: http://ssrn.com/abstract=630862.

Warren, Elizabeth and Amelia Warren Tyagi. 2003. *The Two-Income Trap*. Basic Books.

Watts, Harold. 1977. "The ISO-PROP Index: An approach to the determination of poverty income thresholds," in Marilyn Moon and Eugene Smolensky, eds *Improving Measures of Economic Well-Being*. Academic Press.

Weagley, R. O., and P.S. Norum. 1989. "Household demand for market purchased, home producible commodities." *Home Economics Research Journal* 18: 6-18.

West, Donald and David Price. 1976. "The Effects of Income, Assets, Food Programs and Household Size on Food Consumption." *American Journal of Agricultural Economics* 58(4): 725-730.

Willis, Robert. "Mincer Award Winners 2008: Reuben Gronau." Available at: http://client.norc.org/jole/soleweb/Mincer-2008.html (assessed May 24, 2011).

Wolff, Edward. 2002. "Economic Status of Parents," in Sylvia Ann Hewlitt, Nancy Rankin and Cornel West, eds *Taking Parenting Public: The Case for a New Social Movement*. Rowman and Littlefield Publishers, Inc.

Yen, Steven. "Working Wives and Food away from home: The Box-Cox Double Hurdle Model." *American Journal of Agricultural Economics* 75 (1993): 884-895.

Zedlewski, Sheila. 2002. "Family Incomes: Rising, Falling or Holding Steady?" in Alan Weil and Kenneth Finegold, eds *Welfare reform: the next act*, pp. 53-76. The Urban Institute Press.