Detecting Household Production

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ABSTRACT

The economics of household choice has occupied an important position in both microeconomics and macroeconomics since Becker's (1965) pioneering work. Yet our empirical understanding of the household sector is hampered by the absence of measurement of this sector's output. Our paper contributes to our knowledge of the extent of home/market substitutions by utilizing detailed expenditure data provided by the Consumer Expenditure Survey (CEX). We compare expenditures by married, 1-earner households to expenditures by married, 2-earner households. Single-earner households have more non-market time that maybe be spent in home production or leisure. We detect the presence of several home/market substitutions across family types that are consistent with the theory.

The economics of household choice has occupied an important position in both microeconomics and macroeconomics since the pioneering work of Becker (1965).[1] Yet our empirical understanding of the household sector is hampered by the absence of measurement of this sector's output.[2] When individuals combine time, groceries, and a stove to produce a meal, we cannot measure the quality or economic value of that meal in the way that one can if the meal is prepared in a restaurant. This paper contributes to our understanding of the extent of home/market substitutions by utilizing the very detailed expenditure data provided by the Consumer Expenditure Survey (CEX).[3] Although we do not observe the home-prepared meal, we do observe the purchases of groceries. We also observe households' purchases of restaurant meals. Thus, we can examine whether households with more nonmarket time available purchase relatively more groceries and relatively fewer restaurant meals. Further, using detailed diary data on the specific grocery items purchased, we can determine whether households with more nonmarket time purchase relatively more groceries in an unprocessed state requiring significant time to prepare—bread flour instead of a loaf of bread. Thus, we detect the presence of home/market substitutions through the effect these substitutions have on the pattern of goods purchased by households. We determine whether expenditure patterns differ across married households with one full-time worker vs. two full-time workers in the manner suggested by the theory of household production. Specifically, to what extent do households substitute home-produced goods for market goods when market hours are reduced?

The Consumer Expenditure Survey (CEX) asks non-working individuals the reason why they are not working. Overwhelmingly, working-age respondents state that they are absent from the labor market in order to take care of the home and household. This makes the CEX ideal for studying home/market substitutions that lie at the heart of home production theory. The CEX contains information on over 700 goods, of which we identify over 400 that pertain to

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[1] Some examples of papers using home production to explain macroeconomic phenomena include Aguiar and Hurst (2007a), Baxter and Jermann (1999), Benhabib, *et al.* (1991), Bils, *et al.* (2009), Campbell and Ludvigson (2001), Canova and Ubide (1998), Gomme, *et al.* (2001), Greenwood and Hercowitz (1991), Greenwood, *et al.* (1995), Ingram, *et al.* (1995), McGratten, et al. (1997), and Ngai and Pissarides (2007). Other recent applications of home production theory include Aguiar and Hurst (2007b), Burda and Hammermesh (2009), Deaton and Paxson (1998), Graham and Green (1984), Gronau and Hammermesh (2009), Ramey (2008), Rogerson (2008), and Rupert, *at al.* (2000). See Gronau (1986) for a survey of earlier work.
[2] There is a long literature that measures household production via a link between observed variables and unobserved household production. Classic papers include Kendrick (1979), Eisner (1988), and Rosen (1996). For recent contributions, see House, *et al.* (2008) and Hammermesh (2008).
[3] While many recent studies have utilized time use data in order to understand household production (c.f., Aguiar and Hurst (2007b) and Ramey (2008) for historical perspectives), much less attention has been paid to the other factors involved in the production of home goods.

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home/market substitutions. We examine both diary data and interview data on expenditure. Using the interview data, we construct five groups of goods that highlight different aspects of home production. We also construct two groups that are devoted to leisure goods. Our inclusion of leisure goods allows us to identify the way in which leisure interacts with labor market decisions. In standard macroeconomic models, including home production models, leisure is produced by time alone. Our work highlights the importance of leisure expenditure, both as a major budget category and as a potential source of important differences across household types.

The diary data supplements the interview data with extremely detailed expenditure information, contemporaneously recorded, on groceries and restaurant meals. For groceries, the information is detailed enough to allow us to separate goods into those requiring high levels of time input for preparation (bread flour) vs. goods requiring little time input for preparation (granola bars). For restaurants, we know which meal was eaten (e.g., breakfast) and the type of restaurant (e.g., fast food establishment).

Section 2 begins by quantifying the differences in expenditure across household type without attempting to control for differences in potential income, number and ages of children, age, etc. We document significant differences in expenditure in several categories that are consistent with the predictions of household production theory. We then proceed to estimation of the differences in expenditure across family types.

Section 3 describes the econometric technique that we use to generate meaningful expenditure comparisons across family types. We use propensity score matching with regression which is often used to evaluate the effects of a job training program on trainees' income. The idea is to match individual who received training with a 'similar' non-trainee, where 'similar' depends on the workers' characteristics via their influence on the propensity score. The specific thought experiment that we consider is a female full-time worker exiting the labor force in order to care for the home and children (if any). We do this by comparing the expenditures of a one-earner family with a 'similar' two-earner family, then using regression to adjust for remaining differences in potential income, actual income and demographics. This allows us to isolate changes in expenditure due solely to the difference in the labor market status of the family members.

Section 4 reports the results of the estimation. The estimated effects are, in nearly every category of goods, consistent with the substitutions predicted by home production theory although the size of the effects is reduced in several cases relative to the values observed in the

raw data. This is partly due to the fact that the empirical strategy controls for income differences which are an important determinant of the differential expenditure patterns of one-earner vs. two-earner families. Section 5 concludes with a brief summary of our results and a discussion of paths for future research.

2. Classification of Goods and Stylized Facts

We use data from the Consumer Expenditure Survey (CEX). There are two distinct surveys: (i) an interview survey (CEXI) for expenditures over the course of the quarter preceding the interview, and (ii) a weekly diary survey for small, everyday expenditures (CEXD). The interview survey is attractive because of its broad coverage of expenditure categories, but has the drawbacks of all interview surveys in that it uses retrospective reporting of expenditure. Diary surveys are known to be more accurate than recall surveys (Kan (2006)) making the diary component of particular interest. However, diary survey records are kept for fewer and less comprehensive expenditure categories over much of the survey period. Families report only one or two consecutive weeks of expenditure data which are averaged and used as a single weekly observation. The housing data included in the diary survey is less detailed than for the interview survey.

Attanasio, et al. (2006) show that in the 1982-1987 period there was substantial instability in the way that particular questions were worded leading to inconsistency in measurement within particular categories, notably the groceries and food-at-home category. We therefore restrict our use of this data to the 1988:1-2007:1 (2006:4 for CEXD) subsample. The Data Appendix contains additional detail on construction of the dataset.

Because of our interest in detecting behavior consistent with home production, we confine our attention to households with married couples younger than retirement age.[4] With two individuals, both capable of both home and market production, we expect to see the greatest within-family potential for home vs. market substitutions as predicted by Becker (1981). The CEX asks individuals who do not work in the market why they are not working. Possible answers include (i) taking care of the home/family; (ii) ill health; (iii) student status; (iv) looking for work; and (v) other. The reasons given for staying home vary by gender, as shown below. The responses are summarized in Table 1, Panel A. For 89% of women, the stated

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[4] The CEX has formed the basis for many studies of consumption over the lifecycle; see, for example, Fernandez-Villaverde and Krueger (2009).

reason for abstaining from market work is taking care of the home and/or family. Only 20% of non-working men give this reason. For men, the main reason is disability (60%). Non-working women rarely state that they cannot find work (only 1%), compared with 10% of men. To focus on home/market substitutions, we drop families in which the reason for not working is anything other than taking care of the home/family. We also drop the few families in which the stay-at-home spouse is male.

The resulting sample contains two types of families: (i) the "type-1 family" which has 1 earner (a male full-time earner and a non-working female who has stated that she is staying home to take care of the home/family); and (ii) the "type-2 family" with two full-time earners. In the final CEXI (CEXD) sample, we have 98,046 (27,224) families. In both samples, 73% of the families have 2 workers.

Socioeconomic Differences across Family Types

Before turning to description of the expenditure categories, we present some important facts regarding the two family types. The data in this section are from the CEXI; the statistics do not differ importantly from those derived from the CEXD sample.

The age distributions of the two family types are remarkably similar. However, the family types differ with respect to number and ages of children, as shown in Table 1-B. Specifically, 75% of 1-earner (type 1) families have children in the household compared with only 58% of 2-earner (type 2) families. Just over 50% of 1-worker families have at least one child younger than school age whereas only 28% of 2-worker families do.

The majority of families in the CEX live in an owned home, as shown in Table 1-C. Only 26% of 1-worker families and 19% of 2-worker families rent their homes/apartments. Both types of families are more likely to have a mortgage than not, although the proportion owning a home mortgage-free is higher for 1-earner families.

On average, 2-earner families earn more than the 1-earner families. However, males in 1-earner families earn more, on average, than their 2-earner counterparts, offsetting roughly half of the income earned by working families in comparable 2-earner families.

The CEXI includes information on the number of rooms in a house, number of baths, number of bedrooms, age of home, and lot size. The distribution of housing characteristics for owned homes is very similar across the two family types. The amount spent on rent and mortgage payments is discussed below with expenditures on other capital goods.

Expenditure Categories

The interview survey contains information on over 700 goods. Each good is identified by a Universal Classification Code (UCC). Of these, we identified about 400 goods that were related to the production of home goods and services or to the costs of working in the marketplace.[5] These goods were sorted into seven major categories according to the role that each type of good plays in household choice. The details of the allocation of goods to categories are shown in Appendix Table A-1. The major categories are:

1) Inputs to home production
2) Utilization of household capital
3) Substitutes for home production
4) General leisure purchases
5) Travel
6) Fixed costs of going to work
7) Household capital

The first three categories pertain to the household's choices concerning market work vs. home work and, correspondingly, purchases of market goods vs. production of home goods. There are two leisure categories—one measuring general expenditures (music lessons; a tennis racquet) with the other measuring travel. A separate category measures goods related to the fixed cost of going to work: taxi and bus expenditures, business clothing, etc. The last category has information on expenditures pertaining to all household capital goods, including purchases of consumer durables and rent. This category also reports the respondent's estimates of the value of owned homes.

Within each category there are several minor categories. For example, one major category is "substitutes for home production." This major category has seven minor categories: (i) food away from home, (ii) child care, (iii) home maintenance services, (iv) contractor's

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[5] The BLS defines 702 Universal Classification Codes (UCCs) in order to classify goods throughout the sample period. Not all of these codes are used in every quarter of the survey. During different time periods, the same good may be assigned different UCCs. We ensure that a particular good remains in the same major and minor category over time, even if the UCC representing the good changes.

services, (v) coin-operated laundry and dry cleaning, (vi) alterations, and (vii) non-coin-operated laundry and dry cleaning. The number of minor categories differs across major categories.

Table 2 summarizes expenditures by family type. Major categories are indicated by bold face type, with minor categories listed below. For each category, statistics are presented separately for each family type. The time period covered is a quarter of a year for the interview data, and a week for the diary data. Expenditure shares for interview data are computed relative to non-housing quarterly expenditure. Shares for diary data are computed relative to the total expenditure in that category (e.g., the shares for diary data on food purchased at grocery stores sum to 100%). We view each family in the sample as an observation on families of a given type. Sometimes families of that type will make a purchase in a given time period and sometimes they will not. By including all families of a given type in the computation of the unconditional expenditure figures, we have a snapshot of what a 'typical' family of that type will spend in a 'typical' time period.

Panel I of Table 2 shows the percentage of families purchasing the good. Panel II reports real expenditure, conditional on purchase. Real expenditure, unconditional on purchase, is presented in Panel III (this is equal to Panel I multiplied by Panel II).   Finally, the share of expenditure accounted for by unconditional expenditure on this good is given in Panel IV.[6] Within each panel, the middle column tells whether the statistic for the 1 worker family is significantly greater than (>) or significantly less than (<) the 2-earner family at the 5% level. If a cell in this column is empty, there is no significant difference between the family types.

Inputs to Home Production

This category measures expenditures on all goods that are inputs to the production of household goods. The two minor categories within this major category are (i) food purchased for home consumption, and (ii) goods purchased for do-it-yourself (DIY) activities.   Nearly 100% of all families of both types purchase at least *one* good that is classified as an intermediate input to home production. The real expenditure on goods in this major category is larger for the 1-worker families (approximately $1572) than for the 2-workers families (approximately $1436) whether we exclude non-purchasers or not, since there are very few non-purchasers. The type-1

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[6] See Table A-1 in the Appendix for a complete set of statistics for each good included in the major and minor categories.

families also devote a larger percentage of total non-housing expenditure to this category (26% for type-1 vs. 21% for type-2 families).

Food at Home: Interview Survey

Food purchased for consumption at home is the most important minor category, accounting for nearly all of the interview-survey expenditure in this category. Our measure of food-related purchases includes food and beverages (including alcoholic beverages) purchased at a grocery store, convenience store, or liquor store for consumption at home. We find that expenditure is significantly higher for 1-worker families, both in absolute terms and as a share of overall expenditure.[7]

Food at Home: Diary Survey

In addition to these results for the interview survey, we also have evidence from the diary survey. Summary statistics for these goods are right-justified below the interview survey results. Groceries purchased for consumption at home were divided into three groups according to the amount of additional time or preparation necessary to make the good suitable for consumption.[8] Based on home production theory, we expect that the 1-worker households would be more likely to purchase goods requiring a high level of time input and would devote a higher level of expenditure to these goods. Examples of our "high time input" goods include flour, eggs, etc. Because of the higher value of time in 2-worker households, we expect that they would purchase a relatively higher percentage of goods requiring a low level of time input. Our "low time input" goods include ready-made, fresh biscuits, rolls, and cakes. Clearly there is more than one way to produce finished grain-based food products: bake them yourself, or have the market do it for you.

Panel I shows that nearly all families of both types purchase goods in each of the three categories—1-worker families have significantly higher purchase percentages, but by a very small amount (e.g., 99% make some grocery purchase, vs. 98% for 2-worker families). We expect that 1-worker households should concentrate relatively more of their expenditure on

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[7] Since 1-earner households have lower average income than 2-earner households, it may seem that the share of expenditure must be higher for 1-earner families whenever the level of expenditure is higher. However, in our sample, 1-earner families save a smaller fraction of their current income than 2-earner families, so that there is no necessary relationship between the pattern for the level of expenditure and the pattern for the share of expenditure.
[8] See Appendix table A-2 for details of goods allocated to specific categories.

goods that require higher time inputs. This is, in fact, exactly what we find. Compared with 2-worker families, 1-worker families devote higher shares of their expenditures to high-time-input goods and lower shares to the on the low-time-input goods.

<u>Goods Used for DIY Activities</u>

Returning to the interview survey, we find results for purchases of goods used for do-it-yourself (DIY) activities that are very unexpected from the perspective of household production theory. This category speaks directly to the notion of home production since an alternative to purchasing market services such as painting, home repair, ready-to-wear clothing, etc. is simply to purchase the necessary supplies and do the work yourself. Within this minor category there are twenty-one individual UCCs representing purchases of goods used for painting, wallpapering, flooring installation, plastering, roofing, plumbing, and sewing. In a typical quarter, 26.6% of 2 workers families have a purchase in this category, compared with 27.3% for 1 worker families-- (see panel I). The difference is very small in economic terms, although it is statistically significant. DIY goods represent only 1% of expenditure if we average over purchasers and non-purchasers together or about 4% of expenditure for families that purchase at least one good in this category. There is no significant difference across the two family types in the amount spent or in the expenditure share for this category which is surprising given the importance of the DIY story as one important aspect of the theory of home production.

Utilization of Home Capital

This category comprises all goods for which purchases of the goods are expected to vary with the intensity of utilization of the home capital stock. The minor categories are (i) fuels (including electricity) used for heating the home, for cooking, and for generating light and running appliances (ii) trash collection, since more trash is generated the more activities are undertaken at home rather than purchased in the market (e.g., there is more household trash generated by cooking a meal at home compared with going to a restaurant), and (iii) telephone services, since the telephone is useful in obtaining information services.

Fuels represent the largest of the three minor categories in dollar terms and nearly every family reports purchasing some good in this category. Real expenditure on fuels is higher for 1-worker families, both in levels and as a share of total non-housing expenditure. The difference is significant. The 1-worker families also spend more on trash collection, both in levels and as an

expenditure share, once we condition on purchasing any trash collection services. Further, purchases of phone services are also higher for the 1-worker households, in levels and shares. These suggest broad support for a home production story that has an important role for variable utilization of the stock of home capital. Specifically, the evidence points to more intensive utilization of the home capital stock by the families with an individual staying home to care for the household.

Market Substitutes for Home Production

A very important class of goods contains those goods for which there exists a potential home-produced substitute. Within this major category, we identify seven minor categories: (i) food and alcohol consumed away from home or prepared by others (this category also includes take-out or delivered restaurant food); (ii) child care, (iii) home maintenance services, (iv) contractor's services, (v) coin-operated laundry and dry cleaning, (vi) alterations and tailoring, and (vii) non-coin-operated laundry and dry cleaning.

Food Away from Home: Interview Data

There are two ways to obtain food: prepare it yourself, or pay someone else to do it for you.[9] When an individual's time is valuable, it becomes expensive to shop for and cook one's own dinner. A better solution may be to sell labor in the market and then purchase the meal already-prepared. Thus we expect that families that collectively work relatively more hours will choose to purchase relatively more meals at a restaurant. They may also purchase more expensive meals because of their higher mean income. The interview data strongly support this prediction. A significantly larger share of 2-worker families purchase meals away during a given quarter: 91% do, vs. 84% for 1-worker families. They also spend more, in total, on meals away, both in levels and as a share of overall expenditure.

Food Away from Home: Diary Data

Data from the diary survey allow us to break down expenditures on food away from home in two ways: by meal (breakfast, lunch, dinner, and other food) and by location (fast food vs. sit-down restaurants). Table 2 shows that 94% of 2-worker families purchase at least one

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[9] This category also includes food prepared by others, such as food provided by a caterer. Although this may be consumed at home, from a technological viewpoint it is closer to a restaurant meal than a home-cooked dinner.

meal away from home during the diary period, compared with 89% of 1-worker families. Both types of families report higher-frequency purchases in the diary data, compared with the interview data. This is most likely due to the relatively poorer recall with the interview methodology, compared with a contemporaneous diary.

We see the largest differences in the propensity to consume in the category of "dinner at sit-down restaurants." Specifically, 51% of 2-worker families choose to dine at least once at full service restaurants in a typical week compared to only 40% of 1-worker families. Both types of households spend more on lunches at fast-food restaurants than those at full service restaurants, while the opposite is true for dinners away from home.

Table 3 presents additional information on purchases of meals away from home. The top panel shows the mean number of days per week that each family type purchases a meal at various locations, while the bottom panel shows the mean expenditure on meals per day in which any money is spent on that meal. This table shows that the 2-worker families eat out more frequently across the board, for all meal types and all restaurant classes. In each case, the difference is significant. The biggest difference is in lunch purchase: 2-worker families purchase lunch away from home 2.45 days per week, while 1-worker families purchase lunch only 1.84 days per week. Although type-2 families eat away from home more frequently, type-1 families spend more per meal eaten away for every category of meals. Most of these differences are significant although not large in dollar terms. The difference is about $1 for lunches at full-service restaurants and just under $2 for dinners at full-service restaurants. In summary, the higher expenditure on meals away for 2-worker families is due to the higher incidence of eating away from home for these families, and is not due to higher per-meal expenditure by these families.

Child Care

Child care is another category for which important market/home substitutions are possible. Returning to Table 2, we see that this category also represents a large fraction of expenditure: for the families with a child under six that do report some expenditure for child care, this category represents 14% of total expenditure on non-housing goods (not shown in table). The only other 'everyday' (non-capital) categories with expenditure levels this high are transportation costs and food at home.

The basic statistics support the prediction that families with two full-time workers make heavier use of market-provided child care services than do the families with a full-time homemaker. Specifically, 19% of the 2-worker families purchase child care services in an average quarter, compared with 16% for the 1-worker families. In our sample, 60% of 2-worker families with children under age six purchase child care, compared with only 28% of 1-worker families (not shown in table). For those families that purchase some child care services, the 2-worker families spend an average of $1004 per quarter vs. $402 per quarter for the 1-worker families.

Most of the reported child care takes place in day care centers and nursery schools. The alternative to day care centers is care in the home, either the home of the child's parents or the home of the provider. The 2-worker families are more likely than 1-worker families to choose care in the home of the provider (3.4% vs. 2.9%), while the 1-worker families are more likely than 2-worker families to choose care in the family's own home (4.7% vs. 3.4%). These categories are not exclusive: a family may purchase day care services (work-day child care) as well as care in their own home (e.g., babysitting on the weekend).

Home Maintenance Services

This minor category contains several services that can be provided via the market or performed oneself. The 2-worker families are more likely to purchase items in the category of home maintenance services: 44% purchase at least one item vs. 38% for the 1-worker families. However, there is no significant difference across family types if we include those families with zero expenditure, and the 1-worker families actually have significantly *higher* purchases when we condition on those families making purchases in this category. To see where the differences arise, we take a closer look at the individual items in this category (see Table A-1). The largest dollar amounts, conditional on purchase, are spent on six categories: housekeeping services, lawn and garden services, termite and pest control services, purchases of flowers and plants, and other repair and maintenance services. Although the 1-worker families purchase housekeeping services and gardening/lawn care services in significantly smaller proportions than the 2-worker families, the differences are not large. What is surprising, since it is counter to the predictions of home production theory, is that the 1-worker families spend more than the 2-worker families on housekeeping services and gardening/lawn care services conditional on purchasing these services. These are the two categories which seem to have the best opportunities for home

production. Further, the homemaker in the 1-worker family has explicitly stated that her reason for not working is taking care of the home.

Contractor Services

Hiring a contractor is a more substantial commitment than hiring a lawn service as it typically involves a larger sum of money and a binding legal contract. The largest components of contractor services are (i) home additions and alterations, (ii) roofing; and (iii) flooring installations which are, for most individuals, difficult to reproduce on one's own. We find that 2-worker families are slightly more likely to purchase contractor services in a given quarter, but expenditure differences across family types are negligible whether we condition on making a purchase or not. We expected to find heavier use of contractor services by 2-worker families since the contractor's time can substitute for an individual's time. Possibly, the contractor's expertise is not easily replicated by the homeowner. Another consideration is the fact that a project involving a contractor requires input of the individual's own time to supervise and communicate with the contractor.

Laundry and Dry Cleaning, Coin-Operated

Laundry is a category of expenditure with clear possibilities for home vs. market substitutions. We have information on two types of laundry services: coin-operated and non-coin-operated. Coin-operated laundry takes longer than doing the laundry at home, while dropping off the laundry results in less time being used to obtain clean clothes. We therefore separate these two goods and evaluate them individually.

The services of coin-operated laundromats are likely to be utilized more often by households with more nonmarket time available, as well as by renters and lower-income individuals who may not have space or income to purchase home laundry machines. We do, in fact, find that the 1-worker families purchase coin-operated services more frequently (13% vs. 10% for 2-worker families), and they spend more on them as well.

Alterations, Repair, and Tailoring

Because of the large time cost of mending and altering clothes, we expect that relatively more 2-worker families purchase these goods in the market rather than perform the tasks at home, which is borne out by the data. However, conditional on purchasing these services, 1-

worker families spend significantly more than do 2-worker families. Unconditional on purchase, there is no significant difference between the family types.

<u>Laundry and Dry Cleaning, Not Coin-Operated</u>

We expect higher usage of these time-intensive, low-skill services by type-2 families. The data support this hypothesis: 39% of 2-worker households have purchases in this category compared with only 30% of 1-worker households.   Further, the type-2 workers families spend significantly more when they purchase the good. These findings are in accord with the predictions of home production models.

General Leisure Expenditures

This category contains expenditures on all leisure goods except (i) expenditures on trips and (ii) expenses related to ownership or rental of vacation houses. Travel expenditures are considered in a separate category. Vacation homes are owned or rented by very few families, so these expenditures are not included.

In standard home production models, leisure services are generated using time alone. In fact, leisure services are produced using both goods and time. One cannot watch TV without a TV; one cannot play tennis without a tennis racquet. However, we share with these models the view that leisure services are fundamentally different from other home-produced goods because of the differences in the utility associated with time spent in these activities. In these models, time spent in production of leisure (e.g., going to the movies) generates utility, while time spent in production of other home goods (e.g., cleaning the house) typically produces disutility.

The differences in expenditure on leisure goods across family types will be influenced by (i) the relative value of income and substitution effects of an increase in the shadow value of time on the overall demand for leisure and (ii) the elasticity of substitution between time and goods in the production of leisure services.

Nearly all families purchase some type of leisure good each quarter. We find that total general leisure expenditures are significantly higher for the 2-worker families, although by a small amount. This aggregate masks important differences across particular types of leisure goods, defined as follows: (i) community antenna, cable, or satellite TV, (ii) electronics, (iii) books, newspapers, and magazines, (iv) sports, games, and toys, (v) music, photography, theatre, and movies, and (vi) pets.

For each of these minor categories, the 2-worker families have significantly higher propensities to purchase than the 1-worker families. However, expenditure conditional on making a purchase is significantly higher for 2-worker families only for community antenna/cable/satellite TV. The one category for which expenditure is higher for the 1-worker families is sports, games and toys—this is true whether or not we condition on purchase. When we look closely at the details of expenditure within the sports, games, and toys category, we find that there are three specific goods that account for the higher expenditure by 1-worker families (details not shown in this table). These goods are (i) toys and games; (ii) membership fees for country clubs, health clubs, swimming pools, tennis clubs, etc.; and (iii) fees for recreational lessons or other instruction.

We interpret these results as follows. The goods in the sports, etc. category all require input of time in order to generate utility from ownership of the good. Thus, we expect that households with more available non-market time (the 1-worker households) should, *ceteris paribus*, spend more on goods requiring a significant time input. While income effects and demographic differences may also be important determinants of expenditure on this class of goods, it is interesting that the goods requiring the highest time input—memberships to country clubs, etc., and recreational lessons (which presumably require an initial allotment of time, and probably a commitment to ongoing time input in many cases)—are the goods for which the higher expenditure by 1-worker families is largest.

Travel

Travel is treated as a separate category.[10] Half of all 2-worker households have expenditures in this category in a typical quarter, compared with 42% of 1-worker households. However, the amount spent on travel, conditional on taking a trip, is significantly higher for the 1-worker households.

The data are sufficiently detailed to allow us to identify several sub-categories of expenditure within the overall "trip" category. These are grouped according to the similarity in the UCCs of the specific good. Specifically, our minor categories are: (i) food, beverages,

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[10] We assume that all family-funded travel as leisure although the respondents do not specifically respond to a question about whether the travel is for leisure purposes. Employees of businesses do not typically pay for their own business travel although they may be reimbursed for out-of-pocket expenditures. Entrepreneurs paying for their own business travel will, unfortunately, report a figure that combines business and leisure travel. However, we do have a minor category—recreational expenses-- that speaks directly to leisure rather than business travel.

lodging and alcohol, (ii) luggage and driving expenses, (iii) airfare, (iv) other transportation expenses, and (v) recreational expenses.

For each minor category, the pattern of purchase and expenditure mirrors the pattern for the leisure travel category as a whole. Specifically, 2-worker families have a higher average propensity to purchase, but conditional expenditure by the 1-worker families is higher. This pattern is particularly unexpected in the category of airfare which is the largest expenditure category if we condition on making a purchase. We expected that 2-worker families, having higher time value, would make more use of airline travel than the 1-worker families. Although 2-worker families do purchase airfare more frequently (15% vs. 12%) , 1-worker families spend more on airfare conditional on purchase ($676 for 2-worker families vs. $786 for 1-worker families). The pattern for airline travel is the same as for all other minor categories within leisure travel: the 2-worker families have a higher mean fraction purchasing air travel but spend less conditional on purchase. We do not have information on the duration of the trips taken by these families. However, our evidence is suggestive of more frequent, but shorter (and less expensive) trips taken by 2-worker families and less frequent, but longer (and more expensive) trips taken by 1-worker families.

Fixed Costs of Going to Work

Every family in our sample has at least one full-time worker, so nearly every family reports expenditures related to getting to work. We find that the 2-worker families spend significantly more in this category, as they should since they have two full-time workers compared with only one in the 1-worker families. We divided expenditure in this category into the following minor categories: (i) mass transit and taxis, (ii) driving costs, (iii) personal care including haircuts, (iv) women's clothing, (v) women's footwear and accessories, (vi) men's clothing , (vii) men's footwear and accessories, (viii) watches and jewelry, and (ix) work-related electronics.   Each of these categories captures aspects of the costs of going to work. Clearly, most of these could also be used for non-work-related purposes, but we nevertheless are interested in exploring the extent to which purchases of these goods varies across families with different labor force characteristics.

The first minor category, mass transit and taxis, is related to the physical process of transiting between home and the workplace. This good is purchased by only 9% of families, and there is no difference in this percentage across family types. There is also no difference in the

amount spent, although it represents a higher share of expenditure for the 1-worker families. We had expected that the 2-worker families would have higher expenditure in this category, since if one partner must travel by mass transit to work, it is likely that the other partner must do so as well. However, this is not borne out in the raw data.

The second minor category, driving costs, accounts for over 60% of all expenditure in this category. It contains all fixed and variable costs associated with maintaining and using a motor vehicle. Thus it includes insurance, inspection, and registration fees; purchases of replacement tires and batteries, as well as gasoline, diesel fuel, and motor oil; parking fees and tolls. Clearly, not all of these costs are directly associated with going to work. However, if two individuals are driving to work, rather than just one, there may be higher expenditures in this category. Alternatively, if the "stay at home" partner is doing a lot of driving—taking kids to lessons, doing grocery shopping and errands, etc.—we would observe higher expenditure in this category by the 1-worker families. Our data show definitively that the 2-worker families spend more on driving expenses whether or not we condition on purchase and whether or not the expenditure is expressed as a share of overall expenditure.

The other minor categories—personal care, clothing, and various accessories—include goods that affect the appearance and possibly the productivity of the worker in the workplace. These goods are rarely *required* as part of the job description, but success in many fields does require a certain level of personal grooming and appropriate dress. Of course, personal care services and clothing are purchased for non-work use, and the same haircut that serves well in the boardroom on Tuesday is still serviceable at the soccer field on Sunday afternoon. The same suit that you wear to ask for a raise on Wednesday still looks great at a formal restaurant on Saturday night. Thus, while we admit the difficulty of assigning these goods to work vs. non-work use, we include them here because they do represent part of the cost of working.

The propensity to purchase goods in this group of categories is higher for the 2-worker families—this is true even at the level of individual UCCs as shown in Table A-1. The largest expenditures are for personal care and clothing for men and women. In each case, expenditure is higher for the 2-worker families. These findings support the view that one's appearance is important in the workplace. We also find that expenditure on footwear/accessories and watches/jewelry follows the same pattern although they are less important in dollar terms. The only exception is in the watches/jewelry category, where the 1-worker families spend more

conditional on purchase but the difference is very small ($266 mean quarterly expenditure, vs. $261 for 2-worker families) and is not statistically significant.

We do have one small UCC that is specifically directed at work-related apparel, namely, uniforms. We have information for men's and women's uniforms separately—data are in Table A-1. For men's uniforms, the propensity to purchase is slightly (but significantly) higher for the 2-worker families, but the difference in expenditure, conditional on purchase, is not significant (the difference is about $5). The same pattern holds true for women's uniforms as well. There is probably little scope for choosing one's uniform based on quality, comfort, or price, so the lack of significant differences in expenditure conditional on purchase is not too surprising. The fact that the 2-worker families have higher fractions purchasing uniforms is in line with these goods being a fixed cost of working.

We also have UCCs for clothing items that are more likely to be work-related, such as suits, sport coats, and (for women) dresses and hosiery. We find that, for men's suits and sport coats (these are two different UCCs), the 1-worker families spend significantly more conditional on purchase. However, the 2-worker families spend more on less-strongly-work-related clothing such as coats, sweaters, shirts and pants. The pattern for women is different. For work-related apparel such as women's suits, sport coats, and tailored jackets, there is no significant difference in the amount spent across family types. Two UCCs that are arguably more work-related than not are dresses and hosiery. Here, we do find that the 2-worker families have a higher propensity to purchase and, in the case of hosiery, also spend significantly more. However, for apparel types less strongly related to work, such as coats, sweaters, shirts, pants, etc., the 2-worker families also spend more. Thus, an intriguing contrast emerges between expenditure on men's and women's clothing. The 2-worker families spend more on all categories of women's apparel, and on non-work components of men's apparel. However, conditional on purchase, the 1-worker families spend more on work-related clothing for men.

The last minor category concerns work-related electronics: service for cell phones and car phones, personal digital assistants (Blackberries, for example) and internet service away from home. Again, not all of the expenditure here is clearly related to work but certainly some of it is. We find that more of the 2-worker families purchase these goods, on average, but there is no significant difference in expenditure across family types.

Household Capital, Rent, and Property Value

Capital goods are used together with labor and intermediate goods to produce home goods. The goods included in this category are all durable or semi-durable goods not previously categorized. The CEX reports the expenditure on these goods which represents the gross addition to the stock of the good owned by the household. These goods range from appliances to cars. The CEX reports the expenditure on these goods which represents the gross addition to the stock of the good owned by the household. The survey also ask for the amount of rent paid if the household rents, and asks for the value of the home of the family is a homeowner. In our discussion below, we use the term "capital goods" to mean the group of goods for which purchase amounts are recorded in the interview survey—this does not include rent or house value. We discuss separately our results for rent and value of owned homes.

If capital goods are substitutes for time applied to the home production process, we would expect that households devoting more time to home production employ fewer capital services. This would take the form of (i) more infrequent purchases of capital goods, thus allowing the capital goods to depreciate more fully; (ii) purchases of less-expensive (lower-quality) capital goods when these goods are purchased, or (iii) both. If capital services are, on the contrary, complementary with time in home production, then we would expect that the one-earner households would purchase higher quality capital goods and/or purchase them more frequently. Since much of the literature on home production has, emphasized the labor saving benefits of modernized capital goods, (e.g., Greenwood, et al. (2005) and Bailey and Collins (2009)) we expect that the substitution effect should be the dominant one.

The data show that 2-worker households are more likely to make a purchase of some type of household capital in a given quarter (78% vs. 73% for 1-worker households), and also spend more in this category conditional on making *any* purchases in the category (from panel II: the mean 2-worker expenditure is $2622, vs. $2264 for 1-worker households). These differences are all significant. With this major category, we define five minor categories: (i) appliances and tools, (ii) furniture, dinnerware, and housewares, (iii) new cars and trucks (iv) used cars and trucks, and (v) computer hardware, software, and information services.

The first minor category, appliances and tools, contains those goods that spring to mind first when thinking about home production. It includes all the major kitchen appliances (refrigerator, stove, dishwasher, etc.) and laundry appliances (washer and dryer). This category also includes air conditioners, lawn equipment, power tools, hand tools, and sewing machines.

The 2-worker households purchase goods in this category more frequently on average, (36% vs. 34%), which is a small but significant difference. Conditional on purchasing a good in this category, however, there is no significant difference in the amount spent.

The second minor category—furniture, dinnerware, and housewares—contains 41 distinct goods. The big-ticket items within this minor category are large furniture items (sofas and bedroom furniture) and flooring (carpeting and hard surfacing). The findings here mirror those for appliances and tools: the 2-worker households purchase goods in this category more frequently but the difference is small, albeit significant. The amount spent, however, is not significantly different across family types. If we look just at the big-ticket items, few exhibit any differences across family types in the propensity to purchase the good or the amount spent, conditional on buying (see Table A-1).

We separated purchases of motor vehicles into new and used vehicles. We exclude vehicles used primarily for business purposes or owned by a business. Looking first at new cars and trucks, the 2-worker families purchase these more frequently (3.3% vs. 2.4% of quarters) but the expenditure conditional on purchase is about $25,000 for both family types (the difference is not significant). The mean expenditure share is about 72% conditional on making a purchase in this category—there is no significant difference across families.

Used cars and trucks are purchased more frequently than new vehicles for both family types, and we still find that the 2-worker families purchase more frequently than 1-worker families. Here we do find a significant difference in expenditure: the 2-worker families spend an average of $9332 when purchasing a used car or truck, compared with only $7954 for the 1-worker families. When purchasing used vehicles (but not new vehicles), 2-worker families spend more than 1-worker families, conditional and unconditional on purchase, and even when expressed as a fraction of quarterly expenditure. This is the only good in this major category for which there is a difference in expenditure across family types in both levels of expenditure and the share of total expenditure.

Our last sub-category is computer hardware and software. As with the preceding goods, we find that the 2 workers families purchase goods in this category more frequently than do the 1 worker families (35% of 2-worker families purchase in a given quarter, compared with 29% of 1-worker families). The expenditure, conditional on purchase, is not significantly different between the families.

Overall, we find that 2-worker households purchase capital goods more frequently and tend to spend more on these goods when they are purchased. This suggests that 2-worker households employ higher capital-labor ratios in home production than do 1-worker households, assuming that home goods and leisure goods are both normal goods. These results are in line with home production models in which capital goods are substitutable with time in the production of home goods

We turn next to reports of rent paid and value of the home. We find that 2-worker families spend significantly more when renting than do 1-worker households. However, this is reversed for owner-occupied housing. Here, we find that 1-worker households report significantly higher property value than 2-worker households: $198,539 vs. $174,582. This is surprising, given the lower income level and higher amount of available household time in the 1-worker household. However, the house is also useful in production of leisure services, and this may help explain the higher value of owned homes reported by these families.

This section has documented the expenditure choices that characterize one- and two-earner families. Our findings broadly support theories of home production. More specifically, we have found evidence of precisely those substitutions predicted by models stressing important home/market interactions.

3. Empirical Method

The previous section showed that there are significant differences in expenditure patterns between one-earner and two-earner families and that these differences are largely consistent with the implications of home production theory. However, there are important differences in the average socioeconomic variables across the two family types, so we might just be picking up differences in the way that specific variables (e.g. number of children) are related to expenditure. In order to focus on the effect of the labor supply decision on family expenditure patterns, we must control for differences in socioeconomic variables across family types.

We use an approach based on propensity score matching, an empirical strategy frequently used in the program-evaluation literature. The goal in these studies is typically to determine the effect of a "treatment" (for example, entering JobCorps, a job training program) on an outcome (for example, wages) that is likely to be influenced by the treatment. In our setting, we wish to determine the effect on expenditure of a family's transition from two-worker status (type-2 status) to one-worker status (type-1 status). We must first estimate each family's propensity

score—the family's probability of being type 1. (We discuss the estimation of the propensity score in the next sub-section.) The empirical strategy matches each type-1 family with the type-2 family with the closest propensity score. For each match, we compute the difference in expenditure between the type-2 family and the type-1 family. The mean of these measures gives the conditional effect of a type-2 family transitioning to type 1. The statistic is referred to as the Average Treatment Effect on the Treated (ATT). We combine estimation of the ATT with linear regression as described below.

The Propensity Score and Potential Income

A family's propensity score is its estimated probability of being type 1 (one earner). A key variable in the determination of labor supply is, of course, potential income—the market income that could be earned if labor is supplied to the market. Thus, both spouses' potential income are key variables in our estimation of the family's propensity score. Our approach to estimating potential income is based on the seminal work of Garfinkel, *et al.* (1978), modified for women to account for sample selection bias by using the Heckman (1979) sample selection technique. All the men in the sample work full-time so no selection adjustment is necessary for men. The results of the estimation of potential income are presented in Table 4. The dependent variable is log real earnings over the past year. The coefficients of the model are permitted to vary by gender and race (white and non-white). The specification includes controls for own age and years of education using spline functions, accounting for potentially convex returns to human capital as specified by Lemieux (2006). Additionally, we control for the number of children in the household, region, if the household resides in a metropolitan statistical area (MSA) and the quarter in which the household reports income. We also include weeks worked in the last year and hours worked in a typical week as covariates. In order to correct for women's selection into the labor force, we utilize information about her spouse. To avoid issues of simultaneity that would result from using spousal income directly, we instead include the education and age of a person's spouse in the first-stage selection regression.[11]

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[11] Notably, these controls do almost as well as spousal income in predicting labor force participation. While coefficients on these variables are often significant when also used in the second stage of the regression, this can generally be attributed to collinearity with the respondent's own age and education. The incremental R-squared from the inclusion of these variables is less than .01 for all gender and racial groups. We therefore conclude that we may use these variables in the selection equations and omit them in the second stage.

The children of a family member influence selection via a variable which we call the child index and define as

$$\text{child index}=\begin{cases} \sum_{k=1}^{K}\dfrac{1}{\sqrt{age_k}} & \text{if K>0} \\ 0 & \text{otherwise} \end{cases}$$

with children indexed k=1…K. This variable is intended to capture the effect of time required to care for children. Young children require more time than older children, thus the addition of a young child increases the child index proportionately more than an older child.[12]

Table 4 suppresses some estimated coefficients due to the large number of variables and the large existing literature on this subject. However, it is worthwhile to note that in both specifications for women, the inverse Mills ratio enters the second stage of the regression significantly and our selection variables have significant coefficients in most cases within the first stage. Results for the CEXD are very similar. We calculate potential income of both spouses using these results and the actual demographic characteristics of the household. To compute household potential income, we assume that both family members work 40 hours per week and 50 weeks per year.

With our estimates of potential income in hand, we calculate the propensity score using a probit model.[13] The results are in Table 5. In addition to potential income of each spouse, we include variables to control for the ages and educations of both spouses, the child index, household composition, size of the home (CEXI only), home ownership (with and without mortgage), race, location, and quarter. We find that the propensity score—the probability that a woman stays at home--decreases strongly with her potential income. As a man's earnings capacity rises, the propensity score rises, but this is much less important than the woman's own potential income. The propensity score increases with the number of children under age six, the number of school-age children, the presence of young children within the household, and the child index. Children between the ages of fifteen and seventeen decrease the probability that a woman chooses home over market work. Urban families and those living in the northeast (the omitted geographical category) contain female heads of household with higher propensity scores

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[12] Although the child index variable (and its square) are important for the first stage, adding the child index into the second stage did not increase the R-squared given the other variables in this regression. We therefore retained these variables in the first stage only in order to assist in identification of the decision to work.

[13] Our results are generally robust to alternatively specifying and extreme value (logit) distribution for the propensity score or to relaxing the parametric structure of the propensity score distribution.

for the same level of potential income. Conditional on potential income, women with a college education are more likely to stay at home than those with lower education. Finally, older women and women married to older men are less likely to work.

The effects of potential income on the propensity score are explored further in Figures 1 and 2. Figure 1 illustrates that the propensity score decreases strongly with female potential income. As a man's earnings capacity rises the propensity score rises, but this is much less important for the propensity score than the woman's own potential income. Figure 2 shows the relationship between potential income and the propensity score using a nonparametric regression of the predicted propensity score on the logs of male and female potential income in the CEXI.[14] Again, we see the importance of female potential income for the propensity score. Although the propensity score is increasing in male potential income, the relationship between this probability and female potential income clearly dominates this graph.

Matching and Regression

We match each type-1 family to the type-2 family with the closest propensity score. In effect, this matches observations from the two groups which have the smallest distance between independent variables, using the coefficients from the probit model in order to define a metric space.[16]

Following the approach outlined in Abadie and Imbens (2002), let $Y_{ij}(1), \ Y_{ij}(2)$ denote two potential expenditure levels for family i on good j, depending on whether the family has one worker (type 1) or two workers (type 2). The variable $W_i \in \{1, 2\}$ indicates whether the family has one or two workers. For family i we observe W_i and the associated level of expenditure on good j. We first match each type-1 family with the type-2 family having the closest propensity score and then compute the "average treatment effect for the treated" (ATT) as

$$ATT_j = E[Y_{ij}(1) - Y_{ij}(2) \,|\, W_i = 1].$$

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[14] This regression utilizes a standard normal kernel and Silverman's Rule in order to determine bandwidth separately for the two potential income measures. Because of the covariance between male and female potential income measures, the smoothing parameter is not necessarily optimal. Thus, this graph should be interpreted in a qualitative manner. Results for the CEXD are very similar to those presented for the CEXI.

[16] Dehejia and Wahba (1999) show that this technique yields a consistent estimate for the ATT if the overlap and unconfoundedness conditions are satisfied, as they appear to be in our data.

Next, to correct for differences in other determinants of expenditure between the given type-1 family and its matched type-2 family, we estimate the following regression using ordinary least squares:

$$Y_{ij}(1) - Y_{ij}(2) = ATT_j + (Z_i(1) - Z_i(2))'\beta_j + \varepsilon_{ij}$$

where $Z_i(k), k=1,2,$ is a vector of associated covariates for that include household-level income, as well as the relative incomes of husband and wife ((female earned income-male earned income)/(total earned and unearned income)). The vector Z also includes the ages and education levels of both spouses, household composition, size of the home (CEXI only), home ownership (with and without mortgage), race, location, and quarter. This procedure controls for differences in current income as well as any differences stemming from imperfect matching.

Assessing Overlap and Unconfoundedness

There are two important criteria that our datasets must meet in order for this method to be valid. The first is commonly referred to as "unconfoundedness" (Rosenbaum and Rubin 1983) or as "selection on observables" (Barnow, et al 1980). Unconfoundedness requires that conditional upon our specified variables, family type is random. The second requirement is referred to as "overlap." Each family must have some positive probability of selecting into each type.

In order to insure overlap in our sample, we follow standard practice by selecting a subset of data according to the following rule. After calculating the propensity score, we keep those observations with a predicted probability of being a type-1 family lying within [.1,.9]. Crump, *et al.* (2006) show that in practice this region approximates the optimal set of propensity score values quite well. Figure 3 shows that this leads to treatment and control groups with propensity scores existing within all bins of a reasonable size. Moreover, this graph demonstrates that balance within the covariates is reasonable.

To assess the balance of the dataset between type-1 and type-2 families, we calculate the difference in means of the variables used to calculate the propensity score between the two groups, normalized by the standard deviation. The results are shown in Table 6. Following Crump, *et al.* (2006), we do not use a t-statistic when looking at this difference, as for a given difference, this measure would increase with sample size. Differences are considered small if less than 0.25, and are considered substantial if this measure exceeds 0.5. While some variables

(female potential income, the child index, indicators for any child under twelve, and the number of children under five) have differences in excess of .25 standard deviations by family type, in no case is the normalized difference greater than .5.

In order to evaluate unconfoundedness, we consider how family type influences past expenditures. If all families at one point had both members working full-time (as may be reasonable given that we bound the propensity score away from zero and one), we would see no differences in expenditure during the period in which all families were type 2. Unfortunately, neither of the expenditure surveys provides substantial data on past expenditure; however, we may use property taxes in order to proxy for original expenditure on one's home. (Purchase price of the home is included as a question in the CEXI but very few of our selected families provide values for this variable.) As families may change type throughout their lifetimes, we would expect that differences in these taxes would be largest for families with homes purchased very recently. In fact, this is precisely what we see. Restricting the sample to homes owned for various amounts of time, Table 7 shows that for very little restriction on the amount of time living in the home, the ATT effect for property taxes are significantly higher for type-1 families. But when one considers homes purchased four or more years in the past, the difference in property taxes paid by family type is generally smaller and insignificant. This supports unconfoundedness. Overall, it thus appears that the basic assumptions of the econometric model in terms of overlap and unconfoundedness are satisfied. We thus proceed to calculation of differences in expenditure patterns using propensity score methods.

4. Empirical Results

This section uses the empirical strategy described in Section 3 to determine the expenditure effects of changes in the number of full-time earners, holding fixed other family characteristics. The particular experiment we consider is as follows: a household with two full-time earners changes to a household with a male full-time earner and the female not working in the market. In particular, the wife is assumed to be at home taking care of the household and children, as reported by nearly 90% of non-working women in the survey. We estimate this measure for the entire set of type-1 families, as well as several subsets of interest. For example, we examine the effects of young children by considering (i) families with no children; (ii) families with children, whom are all under six; and (iii) families with any children ages six to seventeen. In order to deduce differences over income levels, we also study (iv) low income

families (between the 10th and 40th income percentiles and (v) high income families (between the 60th and 90th income percentiles).   Finally, we consider how the effect of having one family member staying at home differs by age, considering (vi) families where the average age of the spouses is less than or equal to forty, and (vii) those with an average age of over forty.[18]

Table 8 reports our results.[19] The first column of Table 8 lists the goods categories. The next column shows the percentage difference in expenditure in the raw data, using two-earner (type 2) family expenditure in the denominator. A positive entry meaning that the one-earner (type 1) family spends more on this good in the raw data. Nearly all the differences are significant, so to save space we do not report significance levels. We present these figures here as a benchmark against which to view our estimates. We discuss the results for each category of goods in turn.

Inputs to home production

Food purchased at grocery stores for consumption at home is an extremely important input to the production of home goods and is one good for which home/market substitutions are readily available. Further, there are good opportunities for substitution between doing your own small repairs (DIY) and hiring someone to do them. For our sample as a whole, we estimate a 4% increase in all intermediate inputs from the interview survey (food plus DIY inputs), which is significant at the 1% level.

Expenditure on food at home, as reported in the interview survey, has an estimated increase of 4%. The family sub-samples show significant estimated increases in food expenditure across the board. The largest increases are for (i) families without children (8%) and (ii) families with high incomes (13%). These results clearly suggest an increase in home production of meals with the change in labor force status of the wife.

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[18] While Deaton (2009) argues that the selection of subsamples may lead to data mining in the evaluation of treatment effects, we believe this criticism does not explicitly apply to this study; we selected these specific subgroups based on the varying opportunity costs of female labor force participation. Moreover, work by Gelber (2009) suggests that these separations are important because the substitutability or complementarity of spousal time outside of the labor force depends on these demographic characteristics.

[19] The estimation was carried out in levels, but we report the results in percentage terms since the levels of expenditure differ so much across the goods. The denominator is matched type-2 expenditure. Results similar to those in the table generally hold when we simply match on the propensity score and weight using the propensity score. We calculate standard errors using the normal heteroskedastic-robust regression estimates. Again, few of our results are altered when we use alternative methods (nonparametric subsampling techniques) for calculating the variance of the ATT.

The detailed diary data allow us to examine whether the change in family type induces the expected substitution away from ready-to-eat groceries and toward those requiring high time input to prepare. Our results show strong support for this hypothesis. In the full sample, purchases of high--time-input goods rise by 9%. Further, each of our family groups shows substitution toward high-time-input goods, with the exception of households with older children who purchase more of all types of groceries in approximately equal proportions. The largest increases in purchases of high-time-input goods occur in both types of families with children (32%-39%), low-income families (15%), and younger families (12%). There are very few significant changes in purchases of intermediate- and low-time-input goods. Overall, these diary data provide strong evidence of the substitutions predicted by home production models resulting from an increase in the non-market time available to the family.

We turn now to consideration of DIY expenditure. One puzzling result found in the raw data was the insignificant difference in DIY expenditures between the family types. Possibly, a higher tendency toward DIY activities in one-earner families was offset by lower income in the type-1 families. Our estimates, which correct for income differences as well as differences in other family characteristics, do predict increases in DIY expenditures for every family group, but these estimates although large in absolute value are mostly not significant. The exception is for low-income families, where expenditure rises by a significant 50%.

Utilization of Home Capital

Evidence on the utilization of home capital is a very important signal of the extent of home activity. More intensive use of the home, whether for home production or leisure, should lead to higher expenditure on fuels, trash collection, and phone services. Following the change in family type, we estimate a significant 2% increase in utilization using the full sample. Low-income families have the largest estimated effect (6%). For fuels only, families without children, low-income families and older families have significant increases. Phone services show the largest increases for poorer families (10%) and older families (4%).

It is not surprising that utilization of home capital, in the form of increased fuel and utility use, is higher when a full-time earner leaves the work force specifically to care for the home. More lights are on during the day, heating and cooling are used more intensively to maintain a comfortable temperature around the clock, and the home phone may, to some extent, substitute for the workplace phone to make home-related calls. The results for this group of

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goods is in line with the predictions of home production models. Toward the end of this section, we discuss results on the amount of rent paid and the value of the home itself.

Market Substitutes for Home Production

We have studied the results for home-produced goods such as meals and DIY repairs, and found that these increase when one full-time earner exits the workforce. Home production theory predicts that the wife's exit from the labor force should lead to decreased purchases of goods for which there is a viable home-produced substitute. This category considers exactly these goods. The estimated effect on the aggregate of these goods is a decline of 12% following the change in family type. Large declines are also found for families with children, poorer families, and younger families. No family type has an estimated increase in these goods, although high-income families show zero estimated effect. However, this category aggregates many dissimilar goods, so it is particularly important to focus on these disaggregated results.

Food Away from Home

 Probably the most-cited example of home/market substitutions involves the substitution of home-cooked meals for restaurant meals. We have seen that groceries purchased for home consumption increase significantly with the change in family type. What happens with restaurant meals? As expected, we find a significant decline in food away from home. In the full sample, the interview data show a significant decline of 11%. The estimated declines are even larger (and still significant) for several family sub-groups.

The diary survey, which contains detailed information on the type of establishment and the exact meal consumed, shows a significant decline of 9% for the full sample. This decline is concentrated in lunch and dinner away from home, especially at fast food establishments. The same pattern also holds for families with young children, poorer families, and younger families. However, a different story emerges for families without children and families with older children. For these groups, full-service restaurant meals register the largest decline, ranging from -48% to -67%.

Child Care

Child care is a major source of expenditure for two-earner families with children. In the raw data we found that child care expenditure was 69% lower for all one-earner families

compared with all 2-earner families. Our estimated results are also large and consistent with theory. In the full sample, we find a significant decline of 67%. The percentage declines in child care expenditure are very similar across most family sub-groups, although the *levels* upon which these percentages are based are very different. The largest percentage declines are for families with an older child, where expenditure is predicted to fall by 69%. Families with a younger child and families with low incomes both decrease child care expenditure by just over 50%, while upper-income families have the smallest estimated decline of 28%.[20]

Home Maintenance Services

We expect that expenditure on home maintenance services should be lower for 1-earner families since all of these families have explicitly stated that the reason that the woman is at home is to take care of the home and/or family. In the raw data, we found that expenditure on home maintenance services by these families was insignificantly different from expenditure by 2-earner families. Our estimation, however, predicts an increase of 15% on home maintenance expenditure following the wife's departure from the labor force, although this is not statistically significant. There are two sub-groups for which we have significant increases in expenditure on this good. Families with older spouses increase home maintenance expenditure by 22%, while families with young children increase expenditure by 106%. We find a significant decline in expenditure by families with older children (-62%).

The fact that purchases of home maintenance services do not change significantly in the aggregate and actually increase for two family groups is surprising and difficult to reconcile with home production theory. In fact, this finding is in direct opposition to the household's stated purpose for choosing to have a non-working wife: "taking care of the home and family" was the reason given by 89% of families for the wife's not working in the market!

Contractor Services

We expect declines in purchases of contractor services when the wife exits the workforce. As with home maintenance services, some things that contractors do can be done by an individual in her own home. We do, in fact, find an increase of 28%, but this is not significant.

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[20] See Guryan, *et al.* (2008) for a survey of literature related to childcare choices over the income distribution.

Point estimates for the family sub-groups show a range of positive and negative values, none of which is significant. Overall, we conclude that the wife's labor force status does not affect the decision to purchase contractor services. One possible explanation for the failure to substitute away from contractor services when the wife leaves the labor force is that contractors provide services that are specialized to the point that a typical householder cannot do this job well. However, although this consideration may temper a DIYer's attempts to do his/her own electrical work, painting is frequently done by homeowners. Further, for these goods, the survey is very careful to separate inputs (paint, for example) for the homeowner's own use from paint purchased for someone else to apply. We conclude that this category of goods represents an important departure from the general pattern of adherence to the predictions of home production models.

Laundry, Alterations, and Dry cleaning

As described in Section 2, we expect coin-operated laundry and dry cleaning services to be utilized most heavily by those households with a larger endowment of non-market time. As in the raw data, we find that the type-1 family has a higher expenditure on these services, although by 5% (not significant) compared to 50% in the raw data. Conversely, we expect that alterations/repair and non-coin-operated laundry should show lower predicted expenditures by type-1 families since these are labor-saving services. Again, we obtain the expected sign--our estimates are for 6% lower expenditure on each of these services by type-1 families, but the estimates are not significant. For all three of these categories, the point estimates display a range of positive and negative values, mostly insignificant. Overall, we find little in the way of strong evidence of home/market substitutions for this class of goods.

General Leisure Expenses

This category aggregates all goods that act as inputs to the production of leisure services. Although the standard household production model assumes that leisure is produced by time alone, it is hard to play tennis without a racket. The raw data indicated 6% lower aggregate leisure expenditure for one-earner households. However, once we correct for income and demographics, we estimate a small, insignificant increase in overall leisure expenditures when the wife exits the labor force. The only significant change is for families with young children, who decrease leisure expenditure by 17%.

The aggregation of many leisure goods into one category masks large estimated effects of different signs in the sub-categories. For example, the estimated effect of the change in family type are declines in expenditure of 7% on cable/satellite television and 10% on electronics. By contrast, the 1-earner households spend 7% *more* on sports, games, and toys, 7% more on music, photography, theater, and movies, and 8% more on pets, although none of these is significant. Few of the family sub-groups show significant effects. Families without children and wealthier families spend significantly more on books, newspapers and magazines (11% and 16% more, respectively). Higher expenditure on pets is found for wealthier households and older households.   Our results show that the type of leisure and the way it is produced varies significantly across family types. These results should inform future modeling efforts in the household production literature. Taken together with work by Krueger, *et al.* (2007), this also may have interesting implications for actual leisure flows and the dependence of the optimal choice of leisure activities on the family's labor market status.

Travel

Our raw data indicated lower travel expenditure for type-1 families by an average of 13%. However, our estimator yields a predicted increase of about 5% in aggregate travel expenditure although this is not significant. The only family group showing a significant effect for the travel aggregate is the group of families with young children, for whom travel expenditures fall by an estimated (and significant) 22%. These families have large estimated declines in several of the travel sub-categories, including luggage and driving expenses as well as recreational expenses. Overall, our results point to no significant effect on travel expenditure or model of travel for the sample as a whole. Families with young children do significantly decrease travel expenditure but don't significantly substitute away from time-saving travel (airfare).

Fixed Costs of Going to Work

Expenditure on fixed costs of going to work is estimated to decline when the wife exits the labor force. In the full sample, we estimate a significant decline of 9% in aggregate fixed costs. Larger declines are found for families without children (-10%), families with young children (-13%), and young families (-11%). This decrease is concentrated in the following categories: (i) driving costs, (ii) personal care including haircuts; (iii) women's clothing (one of

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the largest percentage declines at 13%),; and (iv) work-related electronics (also large at -12%). There is no significant effect in three categories: men's clothing, men's footwear/accessories, and watches/jewelry.

The driving costs category combines all variable costs of owning and operating a vehicle. The vehicle is used for both travel to work and for household and leisure activities. Therefore, driving costs could rise or fall with the change in family type. The estimated decrease indicates that the decline in costs related to going to work are not offset by household use for leisure or for home production activity (e.g., driving to the grocery store).

The predicted decrease in expenditure on personal care and on women's clothing is quite striking and cuts across many family sub-groups. As with the driving costs, the expenditures on personal care/haircuts and women's clothing are useful in non-work situations as well as in the workplace. We looked at specifically work-related sub-components of women's clothing, such as suits, jackets, and uniforms, and did not find larger decreases in these categories than were found on others such as shorts, shirts, etc. The prediction is that the departure of the woman from the workplace will result in declines in all categories of personal care and clothing expenditure, not just those categories that are related to the workplace.

Capital Goods

This section discusses all the capital goods owned by a family, including the home itself, vehicles, and all other capital goods and appliances. The durability of capital goods requires us to think about our implicit model of purchase and replacement. We have a large sample of families of each type, and the estimation strategy incorporates time dummies. We therefore assume that we are estimating a steady state situation in which we observe purchases of new capital goods as needed to replace broken or obsolete units. In section 2, we found that 2-earner families purchase capital goods more frequently than 1-earner families in the aggregate and for the disaggregated goods categories.

If we assume that the capital goods provide a constant level of service until they break, and that the probability of failure is constant over time, then our estimate of the failure probability is the fraction of families purchasing each good, assuming that the family owns just one of each of the capital goods described in each category. This assumption may not be a reasonable one, however, especially for a category like "appliances" which aggregates many goods that are each owned by many families. Even within a narrowly defined category, such as

'vacuums,' (in the appliances and tools category) families may also own several specialized versions of a given type of capital good—a regular vacuum and a cordless or a wet/dry vacuum, rather than a single vacuum used in all circumstances. Further, the quality of a capital good might be related to its failure probability, but this is not necessarily the case. The most expensive dishwasher does not necessarily break down less frequently than a lower-priced model. The dishwasher is expensive because, for example, it is quiet, stylish, gentle on the dishes, and provides a more thorough cleaning. Overall, we conclude that there is no simple, reasonable mapping between the purchase probabilities and the characteristics of the underlying goods.

Non-Housing Home Capital

In the raw data, the change in family type leads to a significant decline of 19% less per quarter on aggregate purchases of non-housing capital goods. Our estimation, however, predicts no significant change in overall expenditure on non-housing home capital goods following the wife's departure from the labor force when looking at the full sample of families. Further, in the full sample, we do not find significant expenditure changes for any of the family sub-groups.

Expenditure in the first minor category, appliances and tools, shows no significant change in the aggregate and in all but two family groups which show significant increases. Families without children increase expenditure on appliances and tools by 41%, while wealthier households increase expenditure by 38%. For most households, therefore, the effect of the wife's departure from the labor market is to increase the labor/capital ratio in home production, as long as even a bit more time is spent on home production following the exit from the labor force. This is the expected effect on the labor/capital ratio from this experiment for most home production models which assume substitutability of time and capital. However, these models would typically predict a decrease in capital expenditure, which we do not find. Further, the fact that capital expenditure actually increases for two family groups suggests a complexity to the household production technology that has yet to be addressed. Why do richer families, and families without children, spend more on capital following the wife's exit from the labor force?

Turning to furniture/dinnerware/housewares, there is a significant 20% increase in the full sample. Low-income families show a significant decline of 34% while older families have a significant increase of 18%. These findings suggest that this group of goods may be luxury goods. Certainly, their role in production of home goods is much less direct than that of food or

tools. It is difficult (and messy) to eat dinner without flatware, yet it is not absolutely necessary to have expensive custom draperies at the windows. We interpret the results for this group of goods as evidence that decoration of the home is important for families with a member staying at home, but that expenditure on decoration is sensitive to family demographic characteristics. Expenditure on computer hardware and software do not change significantly in the aggregate, but increase significantly for low-income families (72%).

Cars and trucks can be used both for home production (going to the grocery store) or for leisure (going to the beach). Although we expect a family transiting to 1-earner status to do more home production, we have no prediction for the effect on leisure. Thus, we have no *a priori* prediction for the effect on purchases of cars and trucks. In the raw data, purchases of both new and used vehicles were lower for 1-earner families compared with two-earner families. However, our estimates indicate that 1-earner families overall will have significantly lower purchases of new vehicles (-14%), as will younger families (-28%).   There is no significant effect on used car purchased for any family group. We believe that the difficulty in precisely estimating these effects stems from the small number of car purchases in our dataset combined with the relatively large number of covariates.

The last row of this section of the table contains information on the number of vehicles owned. In the raw data, the type-1 families owned a mean level of 2.38 vehicles, while the type-2 families owned 2.79.   Our estimates predict a significant decline of 0.26 in number of vehicle owned when family type changes.   A similar result is obtained for several family groups. Combined with our finding of lower driving costs by 1-earner families, these results suggest a decline in overall "transportation services" provided by vehicles when the wife exits the labor force.

Rent and Property Value

In the raw data, rent was lower for 1-earner families compared with type-2 families but the reported value of owner-occupied housing was higher for the 1-earner families. Our estimates go in the same direction – rent is predicted to be lower following the transition in family type, but the 4% predicted decline is not significant.

The property value for homeowners is predicted to rise by a statistically significant 9%. We find significant effects on property value for wealthy families (a 12% increase), older families (10%), and families without children (9%). There is no significant effect on other

family sub-groups. These changes are interpreted as reflecting the change in 'steady state' value of housing between two families differing only in type under the assumption that each of these has had ample time to change homes if desired. The largest adjustments occur for families that also exhibit increases in expenditures on appliances and tools—wealthy families and families without children. For these families, the change in workforce status of the wife leads to an increase in overall expenditure on housing capital, and thus an increase in the flow of services from this capital stock.

5. Summary and Conclusion

The goal of this paper was to determine whether the home/market substitutions predicted by household production theory can be detected in household expenditure data. Our overall finding is strongly supportive of the theory. Across a broad range of expenditure categories, we observe expenditure patterns varying with worker composition of families in ways consistent with the predictions of home production models. However, we also find that expenditure on leisure goods is an important component of overall expenditure, and one which varies with labor force participation for some types of families. The incorporation of produced leisure into modern home production models is an important avenue for future research.

Our empirical findings, broken down by major category, may be summarized as follows. In the raw data, we find that single-earner status is associated with higher spending on intermediates used as inputs to home-produced final goods—mainly groceries. Using the detailed diary data on grocery purchases, we found that the one-earner families purchased relatively more raw/unprocessed grocery items that require higher amounts of time and effort to make the foods ready to eat. These findings strongly support household production theory's prediction that households with more available nonmarket time will shift consumption away from market goods and toward home-produced goods, especially those requiring additional time inputs.

We find evidence of higher utilization of home capital by single-earner households who spend more on fuels and phone services. Since we observe that single-earner households report higher values for owner-occupied housing, the higher expenditure of these households on fuels and utilities may simply reflect a larger house (although we were not able to identify significant differences in numbers of rooms, etc., across families). Alternatively, or in addition, the higher

expenditure on fuels and utilities may indicate higher utilization rates of capital for single-earner households.

We identified several types of goods for which there are important market/home substitution possibilities. Overall, the diary data show a significant decline in total expenditure on restaurant meals, with significant decreases in both lunch and dinners away from home. In the full sample, there are significant decreases in lunches and dinners at fast food establishments, although there are not significant declines in any meal at full-service restaurants. The only family groups showing significant effect of expenditure on full service dinners are families without children, families with older children, and families with older spouses.

Single-earner families spend much less on child care, as expected. But in several cases they spend *more* on home maintenance services: housekeeping, gardening services, and the like. This is something we did not expect, since the stated reason for not working was "taking care of the home."

There are significant differences in expenditure on some goods that are inputs to the production of leisure services. Specifically, single-earner households spend less on cable and television services and on electronics. There is little detectible effect on travel.

Single-earner families spend significantly less on the various costs of going to work. Our driving costs include all costs of maintaining and fueling a car, and thus could have been larger for single-earner families. However, we find the opposite result. Similarly, clothing is used for both work and non-work situations, but we find that expenditure on clothing of most types is significantly lower for single-earner families.

Purchases of non-housing capital goods (appliances, etc.) is not, in the aggregate, significantly affected by the change in family type. Two family types actually increase expenditure on capital goods: families without children and wealthier families. These two family types also report having more valuable houses if they are homeowners, which is also true in the aggregate.

Overall, our results show that changes in female labor force participation are associated with important changes in the bundle of goods purchased by the household. The results support the predictions of home production models by demonstrating measurable expenditure effects of home/market substitutions. These expenditure effects appear across a wide range of categories, including inputs to the home production process to substitutes for market consumption, capital utilization, and the costs of going to work. These results demonstrate the importance of

home/market substitutions and highlight the need for future research to better understand the home production process.

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Table 1
Family Characteristics

A. Reasons for Not Working (spouses of full-time earner)

	Taking Care of Home/Family	Going to School	Disability	Can't Find Work	Other	# obs.
Female	89%	3%	7%	1%	1%	59028
Male	20%	8%	60%	10%	2%	6698

B. Children in Household

	% with any children in given age group			
	Age 0-6	Age 7-12	Age 13-17	None
1 worker	51%	32%	19%	25%
2 workers	28%	23%	21%	42%

C. Housing

	Owned, with Mortgage	Owned, without Mortgage	Rented	Other
1 worker	58%	15%	26%	1%
2 workers	69%	11%	19%	1%

Data source: CEXI

Table 2: Expenditure by major and Minor Goods Categories

	I		II			III			IV		
	Proportion buying		Real expenditure conditional on purchase			Real expenditure, unconditional on purchase			Share of expenditure (unconditional)		
	1 earner	2 earners	1 earner		2 earners	1 earner		2 earners	1 earner		2 earners
Inputs to home production	**100%**	**100%**	**$1,573**	**>**	**$1,437**	**$1,572**	**>**	**$1,436**	**26%**	**>**	**21%**
Food at Home	100%	100%	$1,476	>	$1,337	$1,475	>	$1,336	25%	>	20%
Food Purchased At Grocery Stores	**99%** >	**98%**	**$89**	**>**	**$80**	**$88**	**>**	**$79**	**100%**		**100%**
High Time Input	*98%* >	*97%*	*$44*	*>*	*$38*	*$43*	*>*	*$37*	*49%*	*>*	*46%*
Intermediate time input	*97%* >	*96%*	*$19*	*>*	*$17*	*$19*	*>*	*$17*	*21%*		*21%*
Low time input	*97%* >	*97%*	*$27*	*>*	*$26*	*$26*	*>*	*$25*	*30%*	*<*	*32%*
Goods Used For DIY Activities	27% >	27%	$354		$378	$97		$101	1%		1%
Utilization of home capital	**99%** <	**100%**	**$803**	**>**	**$786**	**$795**	**>**	**$782**	**13%**	**>**	**12%**
Home Fuels	96% <	97%	$484	>	$469	$463	>	$456	8%	>	7%
Trash Collection	70% <	74%	$150	>	$142	$104		$105	2%	>	2%
Phone Services	96% <	97%	$236	>	$227	$227	>	$221	4%	>	3%
Market substitutes for home prod'n	**91%** <	**96%**	**$990**	**<**	**$1,224**	**$905**	**<**	**$1,173**	**10%**	**<**	**12%**
Food away from home	84% <	91%	$419	<	$494	$353	<	$448	5%	<	6%
Food Away from Home	**89%** <	**94%**	**$48**	**<**	**$57**	**$42**	**<**	**$54**	**100%**		**100%**
Breakfast Away from Home	*43%* <	*51%*	*$8*	*<*	*$8*	*$3*	*<*	*$4*	*8%*		*8%*
Breakfast at Fast Food	38% <	45%	$5		$5	$2	<	$2	5%	>	5%
Breakfast at Full Service	17% <	23%	$10		$10	$2	<	$2	3%		3%
Lunch Away from Home	*79%* <	*87%*	*$19*	*<*	*$22*	*$15*	*<*	*$19*	*38%*		*38%*
Lunch at Fast Food	70% <	77%	$12	<	$14	$9	<	$11	23%	>	22%
Lunch at Full Service	33% <	42%	$15		$15	$5	<	$6	9%		10%
Dinner Away from Home	*72%* <	*80%*	*$26*	*<*	*$29*	*$19*	*<*	*$23*	*39%*		*40%*
Dinner at Fast Food	54% <	60%	$13		$13	$7	<	$8	18%	>	16%
Dinner at Full Service	40% <	51%	$29		$30	$12	<	$15	19%	<	22%
Other Food Away from Home	*71%* <	*77%*	*$8*	*<*	*$9*	*$5*	*<*	*$7*	*15%*	*>*	*15%*
Child Care	16% <	19%	$402	<	$1,004	$61	<	$195	1%	<	2%
Home Maintenance Services	38% <	44%	$329	>	$288	$126		$128	1%	<	1%
Contractor's Services	16% <	18%	$2,046		$1,973	$323		$350	2%	<	2%
Laundry & dry cleaning, coin-operated	13% >	10%	$86	>	$76	$11	>	$8	0%	>	0%
Alteration, repair, and tailoring	5% <	6%	$45	>	$38	$2		$2	0%	<	0%
Laundry & dry cleaning, not coin-operated	30% <	39%	$81	<	$87	$24	<	$34	0%	<	0%

Table 2: Expenditure by major and Minor Goods Categories

	I Proportion buying			II Real expenditure conditional on purchase			III Real expenditure, unconditional on purchase			IV Share of expenditure (unconditional)		
	1 earner		2 earners	1 earner		2 earners	1 earner		2 earners	1 earner		2 earners
General Leisure Expenses	95%	<	98%	$655	<	$674	$621	<	$658	8%	<	8%
Community Antenna, Cable, or Satellite TV	65%	<	74%	$140	<	$143	$91	<	$106	1%	<	2%
Electronics	62%	<	69%	$177		$184	$109	<	$126	1%	<	1%
Books, Newspapers, And Magazines	65%	<	73%	$80		$81	$52	<	$59	1%	<	1%
Sports, Games, and Toys	62%	<	65%	$393	>	$344	$242	>	$222	3%	>	2%
Music, Photography, Theatre, and Movies	59%	<	66%	$124		$116	$74		$77	1%	<	1%
Pets	33%	<	40%	$160		$166	$53	<	$67	1%	<	1%
Leisure Trips	42%	<	50%	$968	>	$936	$406	<	$466	4%	<	5%
Food, Beverages, Lodging and Alcohol	37%	<	45%	$517	>	$486	$193	<	$219	2%	<	2%
Luggage And Driving Expenses	36%	<	42%	$142		$138	$50	<	$58	1%	<	1%
Airfare	12%	<	15%	$786	>	$676	$92	<	$103	1%	<	1%
Other Transportation Expenses	7%	<	9%	$303		$295	$22	<	$28	0%	<	0%
Recreational Expenses	20%	<	26%	$238	>	$225	$48	<	$58	0%	<	1%
Fixed Costs Of Going To Work	99%	<	100%	$1,220	<	$1,465	$1,214	<	$1,464	17%	<	19%
Mass Transit And Taxis	9%		9%	$185		$192	$17		$18	0%	>	0%
Driving	97%	<	99%	$799	<	$933	$773	<	$920	12%	<	13%
Men's Clothing	43%	<	48%	$187		$188	$80	<	$91	1%	<	1%
Personal Care Including Haircuts	76%	<	84%	$114	<	$125	$86	<	$104	1%	<	1%
Women's Clothing	55%	<	66%	$201	<	$225	$111	<	$148	1%	<	2%
Women's Footwear and Accessories	33%	<	39%	$72	<	$79	$24	<	$31	0%	<	0%
Men's Footwear and Accessories	26%	<	30%	$81		$82	$21	<	$25	0%	<	0%
Watches and Jewelry	20%	<	24%	$266		$261	$54	<	$63	0%	<	1%
Work-related Electronics	23%	<	31%	$205		$209	$47	<	$64	1%	<	1%
Household Capital	73%	<	78%	$2,264	<	$2,622	$1,647	<	$2,044	10%	<	11%
Appliances and Tools	34%	<	36%	$339		$338	$117	<	$123	1%		1%
Furniture, Dinnerware, and Housewares	50%	<	53%	$580		$554	$293		$294	3%	<	3%
New Cars And Trucks	2%	<	3%	$25,592		$25,103	$609	<	$835	2%	<	2%
Used Cars And Trucks	7%	<	8%	$7,954	<	$9,332	$555	<	$700	3%	<	3%
Computers; Hardware And Software	29%	<	35%	$251		$258	$73		$91	1%		1%
Rent	N/A		N/A	$590	<	$624	N/A		N/A	N/A		N/A
Owner-estimated Property Value	N/A		N/A	$198,539	>	$174,582	N/A		N/A	N/A		N/A
Total non-housing expenditure	100%		100%	$8,238	<	$9,125	$8,238	<	$9,125	100%		100%

Quarterly data from the interview survey in black. Weekly expenditures from the diary data are right-justified.

Expenditure shares for interview survey are calculated using total non-housing interview survey expenditure. Shares for diary data on food at home and food away from are computed relative to the total for that category only.

Inequality sign indicates direction of statistical significance (5% level).

Table 3: Meals away from home

Mean number of days per week eating meal away from home		1 worker		2 workers
Breakfast		**0.55**	<	**0.76**
	Fast Food	*0.33*	*<*	*0.43*
	Full Service	*0.11*	*<*	*0.14*
Lunch		**1.84**	<	**2.45**
	Fast Food	*0.89*	*<*	*1.11*
	Full Service	*0.26*	*<*	*0.34*
Dinner		**1.07**	<	**1.40**
	Fast Food	*0.47*	*<*	*0.56*
	Full Service	*0.29*	*<*	*0.39*
Other		**1.52**	<	**2.02**

Mean expenditure on meal per day		1 worker			2 workers	
Breakfast		**$**	**6.02**	**>**	**$**	**5.51**
	Fast Food	*$*	*4.77*	*>*	*$*	*4.22*
	Full Service		*12.02*		*$*	*11.85*
Lunch		**$**	**8.21**	**>**	**$**	**8.04**
	Fast Food	*$*	*7.62*	*>*	*$*	*7.17*
	Full Service	*$*	*15.23*	*>*	*$*	*14.20*
Dinner		**$**	**17.78**	**>**	**$**	**16.76**
	Fast Food	*$*	*11.71*	*>*	*$*	*10.86*
	Full Service	*$*	*31.37*	*>*	*$*	*29.53*
Other		**$**	**3.29**		**$**	**3.14**

Notes:
Data on meals without specific location from 1988-2006 CEXD
Data on meals at specific locations from 1998-2006 CEXD

Table 4: Estimation of Potential Income

	Dependent Variable is Log Real Earned Income	White Females	Non-White Females	White Males	Non-White Males
Stage 2	Inverse Mills Ratio	0.25	0.31		
		[8.57]**	[4.66]**		
	Age 30-39	0.06	0.05	0.12	0.09
		[7.66]**	[3.13]**	[17.67]**	[5.44]**
	Age 40-49	0.08	0.06	0.22	0.15
		[10.43]**	[3.19]**	[32.79]**	[9.39]**
	Age Over 50	0.05	0.04	0.26	0.15
		[4.88]**	[1.72]	[32.99]**	[8.20]**
	High School Graduate	0.25	0.22	0.28	0.19
		[20.08]**	[7.98]**	[35.82]**	[9.43]**
	Some College	0.43	0.42	0.43	0.32
		[33.33]**	[15.40]**	[55.49]**	[15.50]**
	College Graduate	0.73	0.70	0.69	0.53
		[54.25]**	[24.42]**	[79.46]**	[22.62]**
	Graduate School	1.00	1.05	0.88	0.86
		[67.03]**	[32.01]**	[88.77]**	[34.15]**
	Observations with Positive Earnings	61722	9672	85940	12106
	R-squared	0.40	0.38	0.28	0.32
Stage 1	Child Index	-0.60	-0.48		
		[25.47]**	[7.86]**		
	Child Index Squared	0.09	0.03		
		[11.30]**	[1.80]		
	Spouse Age 30-39	-0.03	-0.18		
		[1.80]	[3.99]**		
	Spouse Age 40-49	-0.04	-0.15		
		[2.78]**	[3.90]**		
	Spouse Age Over 50	-0.33	-0.04		
		[19.58]**	[0.83]		
	Spouse High School Graduate	0.06	-0.03		
		[3.50]**	[0.56]		
	Spouse Some College	0.02	-0.10		
		[1.09]	[1.85]		
	Spouse College Graduate	-0.20	-0.49		
		[9.66]**	[8.83]**		
	Spouse Graduate School	-0.43	-0.71		
		[18.80]**	[11.36]**		
	Observations	85538	12508	85940	12106

Heteroskedastic-robust t-statistics are reported below stage-2 coefficients, heteroskedastic-robust z-statistics below stage-1 coefficients, which are reported in the z-score metric of the probit specification. Both stages also include controls for own age (10 year groupings), own education (Less than HS, HS Grad, Some College, College Grad, Grad School), region, MSA-status, number of children, and quarter of report. Main-stage regression also controls for weeks worked in last year and typical hours worked per week.
CEXI sample, * significant at 5%; ** significant at 1%.

Table 5: Estimating propensity scores

Probit Regression for being a Type-1 Family Marginal Effects	CEXI	CEXD
Female Real Potential Income/1000	-0.39**	-0.27**
Female Real Potential Income(/10000) Squared	0.30**	0.20**
Male Real Potential Income(/10000) Squared	-0.04**	-0.04*
Male Real Potential Income/10000	0.11**	0.09**
Child Index	0.02**	0.01
Female HS or Some College	-0.01	-0.03*
Female College or More	0.14**	0.04
Male HS or Some College	-0.09**	-0.09**
Male College or More	-0.09**	-0.07**
Female 25-29	-0.04**	-0.05**
Female 30-34	0.02**	-0.01
Female 35-39	0.01*	0.02*
Female 40-44	0.03**	0.06**
Female 45-49	0.02**	0.04**
Female 50-54	0.09**	0.06**
Female 55-59	0.09**	0.11**
Female 60-64	0.14**	0.14**
Male 25-29	0.00	0.01
Male 30-34	-0.02**	0.00
Male 35-39	0.00	-0.01
Male 40-44	-0.03**	-0.03**
Male 45-49	-0.01	0.00
Male 50-54	-0.03**	0.00
Male 55-59	0.03**	0.02
Male 60-64	0.09**	0.08**
Owned with Mortgage	-0.08**	-0.08**
Owned without Mortgage	0.02**	0.04**
Other Housing	0.03*	0.01
Rooms in Home	0.00*	
Full Bathrooms in Home	0.02**	
Half Bathrooms in Home	0.01**	
Number of Kids 0-5	0.09**	0.10**
Number of Kids 6-14	0.02**	0.03**
Number of Kids 15-17	-0.03**	-0.02**
Any Kid 0-12	0.07**	0.07**
Male and Female White	0.05**	0.04**
Urban	0.11**	0.08**
Midwest	-0.08**	-0.06**
South	-0.07**	-0.05**
West	-0.04**	-0.02*
Observations	98046	27224

*-Significant at 5% level, **-significant at 1% level; calculated using heteroskedastic-robust t-statistics
Controls for quarter not shown.

Table 6: Balance in Covariates: Normalized Differences

Variable	Normalized Difference	
	CEXI	CEXD
Female Potential Income	0.27	0.26
Male Potential Income	0.03	0.04
Child Index	-0.41	-0.45
Female HS/Some College	0.12	0.12
Female College or More	0.13	0.13
Male HS/Some College	0.13	0.14
Male College or More	0.01	0.01
Female Age	0.07	0.11
Male Age	0.05	0.09
Own Home, Mortgage	0.18	0.19
Own Home, No Mortgage	-0.08	-0.09
Other Housing	-0.04	-0.03
Number of Rooms	0.03	N/A
Number of Full Baths	0.03	N/A
Number of Half Baths	0.02	N/A
Number of Children 0-5	-0.40	-0.44
Number of Children 6-14	0.04	0.05
Number of Children 15-17	-0.19	-0.21
Any Child 0-12	-0.29	-0.32
Both White	-0.08	-0.09
Urban	-0.05	-0.04
Midwest	0.07	0.07
South	0.03	0.02
West	-0.07	-0.08

Difference Normalized by standard deviation of difference.

Table 7
Quarterly (Real 2000) Expenditure on Property Taxes for Owned Home

Minimum Years Living in Home for Inclusion	Type-1	Matched Type-2	ATT Using Matching and Regression
1	616	558	20.50 *
2	618	555	30.90 **
3	618	559	27.52 *
4	620	568	15.49
5	617	566	10.10
6	616	571	14.88
7	614	575	8.67
8	612	579	7.22
9	606	584	4.89
10	607	589	7.87
11	608	590	9.47
12	609	585	16.89
13	608	592	11.07
14	614	597	8.12
15	619	620	-9.27

As all families do not incur these expenditures in all quarters, means excluding zeros have been used.

*-Significant at 5% level, **-significant at 1% level; calculated using heteroskedastic-robust t-statistics

Table 8: Average Treatment Effect on the Treated (ATT) Calculated using Propensity Score Matching and Regression Method

	1 earner: % higher in raw data	All families	No children	Children under age 6	Any children ages 6-17	10th-40th income Percentile	60th-90th income Percentile	Average spouse age 40 or less	Average spouse age over 40
Intermediate inputs to home prod'n.	**9%**	**4% ****	**9% ****	**3%**	**5%**	**9% ****	**13% ****	**4% ****	**6% ****
Food at Home	10%	4% **	8% **	3%	2%	7% **	13% **	4% **	5% **
Food Purchased At Grocery Stores	**12%**	**4% ***	**-5%**	**20% ****	**36% ****	**10% ****	**-1%**	**5%**	**1%**
High time input	*16%*	*9% ***	*5%*	*32% ***	*39% ***	*15% ***	*2%*	*12% ***	*6%*
Intermediate time input	*13%*	*1%*	*1%*	*5%*	*27% ***	*11% ***	*0%*	*5%*	*-1%*
Low time input	*5%*	*-1%*	*-25%*	*13%*	*37% ***	*3%*	*-7%*	*-4%*	*-7%*
Goods Used For DIY Activities	-3%	6%	11%	19%	55%	50% *	16%	14%	14%
Utilization of home capital	**2%**	**2% ***	**4% ***	**1%**	**-7%**	**6% ****	**3%**	**-2%**	**4% ****
Home Fuels	2%	2% *	7% **	4%	-8%	4% *	4%	-1%	3% **
Trash Collection	-1%	2%	-4%	-3%	-9%	8% *	2%	-5% *	5% **
Phone Services	3%	2%	3%	-4%	-5%	10% **	1%	-2%	4% **
Market substitutes for home prod'n.	**-22%**	**-12% ***	**-9%**	**-27%**	**-38% ****	**-14% ****	**0%**	**-16% ***	**-2%**
Food away from home	-21%	-11% **	-21% *	-19% **	-18% *	-7% *	2%	-13% **	-6%
Food Away from Home	**-21%**	**-9% ****	**-14%**	**-9%**	**-4%**	**-14% ***	**-12%**	**-13% ****	**-5%**
Breakfast Away from Home	*-21%*	*5%*	*-17%*	*12%*	*19%*	*-9%*	*-30%*	*-16%*	*17%*
Breakfast at Fast Food	*-16%*	*0%*	*7%*	*-34%*	*53% **	*-15%*	*-87% ***	*-13%*	*16%*
Breakfast at Full Service	*-23%*	*11%*	*-81%*	*20%*	*-11%*	*17%*	*-12%*	*-21%*	*13%*
Lunch Away from Home	*-23%*	*-16% ***	*-19% **	*-22% **	*0%*	*-22% ***	*-19%*	*-19% ***	*-5%*
Lunch at Fast Food	*-19%*	*-20% ***	*-15%*	*-39% ***	*16%*	*-28% ***	*-55% ***	*-27% ***	*-7%*
Lunch at Full Service	*-20%*	*-19%*	*-40%*	*-51%*	*-48%*	*-17%*	*-31%*	*-7%*	*-20%*
Dinner Away from Home	*-20%*	*-9% **	*-22% **	*7%*	*-24%*	*-2%*	*-9%*	*-7%*	*-13% **
Dinner at Fast Food	*-13%*	*-20% ***	*-14%*	*-9%*	*8%*	*-8%*	*-25%*	*-20% **	*-9%*
Dinner at Full Service	*-22%*	*-5%*	*-48% ***	*32%*	*-67% ***	*-6%*	*0%*	*8%*	*-31% **
Child Care	-69%	-67% **	n/a	-50% **	-69% **	-53% **	-28% **	-55% **	-60% **
Home Maintenance Services	-2%	15%	20%	106% *	-62% *	-5%	-13%	-3%	22% **
Contractor's Services	-8%	28%	-3%	-35%	1%	41%	26%	42%	8%
Laundry & dry cleaning, coin-operated	50%	5%	-5%	-1%	20%	-6%	145% **	18% *	-2%
Alteration, repair, and tailoring	-10%	-6%	7%	386%	-132% *	33%	48%	36%	-11%
Laundry & dry cleaning, not coin-op.	-29%	-6%	-20% **	16%	-17%	6%	-1%	1%	-7% *
General Leisure Expenses	**-6%**	**1%**	**4%**	**-17% ***	**-22%**	**-5%**	**9%**	**-3%**	**3%**
Community Antenna, Cable, Satellite TV	-14%	-7% **	-1%	-5%	-18% **	1%	5%	-9% **	0%
Electronics	-13%	-10% **	-6%	-31%	-20%	-6%	-7%	-8%	-6%
Books, Newspapers, And Magazines	-12%	2%	11% **	3%	5%	3%	16% **	5%	0%
Sports, Games, and Toys	9%	7%	8%	-3%	-43%	-4%	15%	-2%	6%
Music, Photography, Theatre, Movies	-5%	7%	3%	-51% *	2%	-12%	-2%	-7%	9%
Pets	-21%	8%	16%	-33%	41%	-19%	30% *	15%	13% *

Table 8: Average Treatment Effect on the Treated (ATT) Calculated using Propensity Score Matching and Regression Method

	1 earner: % higher in raw data	All families	No children	Children under age 6	Any children ages 6-17	10th-40th income Percentile	60th-90th income Percentile	Average spouse age 40 or less	Average spouse age over 40
Travel	**-13%**	**5%**	**-1%**	**-22% ****	**6%**	**-10%**	**-7%**	**0%**	**4%**
Food, Beverages, Lodging and Alcohol	-12%	-2%	-12%	18%	16%	-31%	-19%	6%	-2%
Luggage And Driving Expenses	-14%	-6% *	8%	-26%	-8%	-6%	-12%	-10%	-5%
Airfare	-10%	1%	-14%	-3%	-35%	-31%	-5%	-19%	5%
Other Transportation Expenses	-22%	4%	-7%	6%	-182%	-6%	27%	-12%	10%
Recreational Expenses	-18%	-9%	-23%	-8%	-46%	-27%	5%	1%	-1%
Fixed Costs Of Going To Work	**-17%**	**-9% ****	**-10% ****	**-13% ****	**-11%**	**-3%**	**1%**	**-11% ****	**-5% ****
Mass Transit And Taxis	0%	0%	-35%	50%	70% *	18%	91% **	24%	13%
Driving	-16%	-11% **	-11% **	-17% **	-3%	0%	-4%	-13% **	-6% **
Men's Clothing	-13%	2%	-4%	25%	-31%	1%	3%	1%	1%
Personal Care Including Haircuts	-17%	-9% **	-13% **	9%	-3%	-2%	1%	-9% **	-10% **
Women's Clothing	-25%	-13% **	-18%	-9%	-45% *	-23% **	10%	-11% *	-11% **
Women's Footwear and Accessories	-22%	-3%	-10%	21%	26%	-17%	22% *	4%	-1%
Men's Footwear and Accessories	-14%	5%	7%	-26%	15%	9%	14%	-4%	9% *
Watches and Jewelry	-14%	8%	14%	-51%	-98%	-10%	14%	0%	11%
Work-related Electronics	-26%	-12% **	-12%	-13%	-16%	-19% *	-9%	-27% **	-9% *
Non-housing Home Capital	**-19%**	**-3%**	**5%**	**4%**	**-8%**	**9%**	**19%**	**-10%**	**1%**
Appliances and Tools	-6%	8%	41% **	-21%	-16%	2%	38% *	-3%	5%
Furniture, Dinnerware, and Housewares	-1%	20% **	5%	-12%	5%	-34% **	30%	13%	18% *
Computers; Hardware And Software	-19%	-3%	-1%	31%	-26%	72% **	28%	0%	-10%
New Cars And Trucks	-27%	-14% **	6%	-20%	-1%	-15%	0%	-28% **	9%
Used Cars And Trucks	-21%	1%	9%	16%	-12%	-13%	10%	-14%	-3%
Number of vehicles (not $ or %)	*-0.14*	*-0.26* **	*-0.14* **	*-0.24* **	*-0.30* **	*-0.02*	*-0.12*	*-0.24* **	*-0.20* **
Rent and Property Value									
Rent	-6%	-4%	13%	20% **	0%	6%	8%	-1%	-17%
Property Value	13%	9% **	9% *	3%	-8%	11%	12% *	4%	10% **

*-Significant at 5% level, **-significant at 1% level. Significance not reported for 1st column.

Quarterly and weekly expenditures reported unconditional on expenditure level.

Weekly expenditures are right-justified beneath associated quarterly expenditure.

ATT and significance calculated in levels. Reported percentage changes are normalized by matched Type-2 expenditure.

Figure 1

Estimated Probability that Family is Type 1 by Potential Income
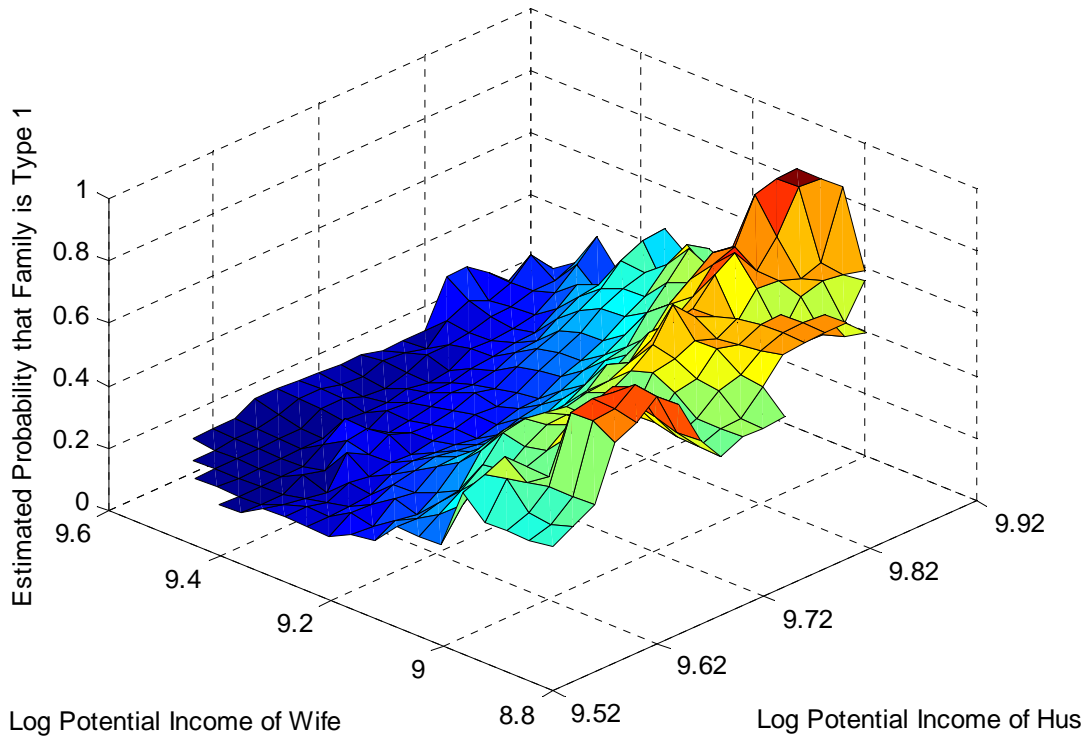
Nonparametric regression results using only log potential income of husband and wife using standard normal kernels and Silverman's rule for determination of smoothing parameter. Observations from CEXI sample used to calculate ATT.

Figure 2

Yearly Income by Gender
10th-90th Percentiles of Gender-Specific Income Distribution

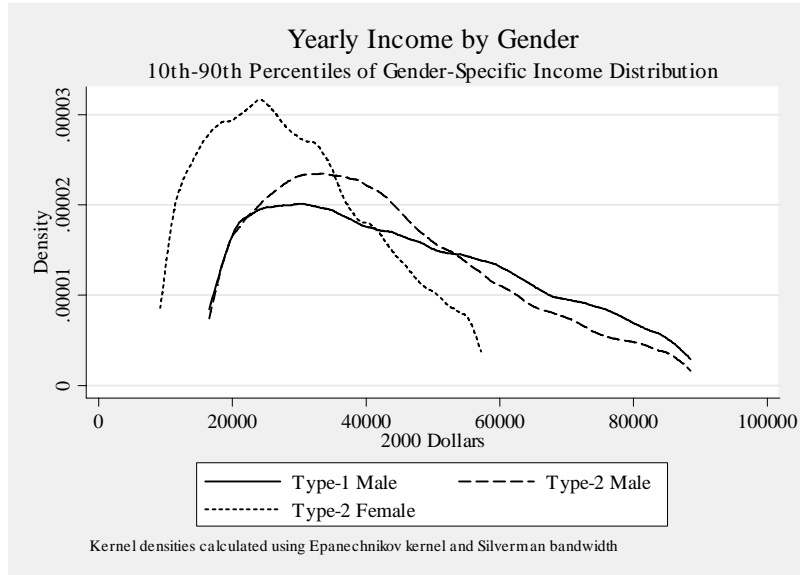Kernel densities calculated using Epanechnikov kernel and Silverman bandwidth

Figure 3: Distributions of Propensity Scores