# Scheduling Complexity: Work Scheduling for American Parents, 1990 and 2012

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**Abstract**
American working conditions have deteriorated over the last 30 years; one commonly-invoked change is the rise of nonstandard and unstable work schedules. Such schedules negatively affect family functioning and the well-being and development of children. The evidence that such schedules are actually increasing in prevalence is, however, quite thin. In this paper, I describe and compare the work schedules of American parents in single-mother and two-partner households in 1990 and 2012. I analyze the schedules of both working and non-working parents and partners, which allows me to address changes in work scheduling – in terms of type, duration, and variability – over time without succumbing to selection problems that are common in research on working parents. I find that nonstandard work has become slightly more common in both single-mother and two-partner households; both types of household experience considerably greater within-week schedule variability in 2012 than they did in 1990. Changes can be explained by neither shifts in population composition nor by concentration of such schedules in the service sector, as is commonly assumed. Instead, it appears that nonstandard and variable work schedules are growing more common regardless of individuals' characteristics.

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# Introduction

Nonstandard and unstable work schedules increase worker stress and strain, shape childcare choices in problematic ways, and are associated with a range of negative outcomes for children. Nonstandard work schedules – evening and night work – are associated with decreased marital stability, fewer shared meals with children, and more complex childcare arrangements (Presser 2003), as well as fewer extracurricular activities for children (Phillips 2002). These schedules are linked to increased worker depression and stress, which may diminish the quality of parent-child interactions and negatively affect children (Han 2005). Nonstandard schedules lead parents to employ childcare arrangements that are less stimulating or developmentally supportive (Han 2004; Kimmel and Powell 2006). Research has demonstrated links between nonstandard work and cognitive and behavioral problems among young children (Han 2004; Joshi and Bogen 2007) and a range of behavioral and relationship problems among adolescents (Davis, Crouter, and McHale 2006; Dunifon, Kalil, and Bajracharya 2005; Han 2005, 2006, 2008; Han, Miller, and Waldfogel 2010; Strazdins et al. 2006, 2004). The consequences of flexible, just-in-time work scheduling – referred to here as unstable schedules – have been the subject of less research, but many of the effects identified for nonstandard work likely hold. Multiple authors, for instance, have documented associations between unstable schedules and increased stress and strain (Henly and Lambert 2014; Zeytinoglu et al. 2004). Unstable work requires parents to have flexible patchworks of care in place and can lead to high reliance on informal care (Henly and Lambert 2005).

This begs two questions: are parents increasingly working such schedules and thereby exposing their children to the attendant consequences? If so, which sorts of households bear the burden of this increase? Growing exposure to such schedules is a cause for concern, especially if

those most likely to be exposed are already disadvantaged. It is generally believed that the prevalence of both nonstandard and unstable work schedules has been on the rise. The prolonged growth of the retail and service sectors – prime areas for nonstandard and unstable work – often leads to the assumption that jobs with such schedules must be growing in frequency. On the other hand, education has tended to offer protection from such schedules and educational attainment has increased over the last half century (Ryan and Bauman 2016). The evidence one way or the other on change over time is surprisingly thin. For nonstandard work there are claims in both directions (Hamermesh 1999, 2002; Presser and Cox 1997); for unstable work we simply do not yet have analyses.

In this paper I attempt to answer the two questions posed above. Using the National Child Care Survey (NCCS) and the National Survey of Early Care and Education (NSECE), I describe the work schedules of American parents in two periods: 1990 and 2012. This comparison provides a snapshot at two points in time. I cannot draw strong conclusions about the trajectory of parental work scheduling during the intervening years on these basis of these data. I do, however, offer an unprecedentedly detailed examination of parental work schedules and their changing correlates. Inclusion of the NSECE is especially important, as this survey offers sociologists of the family an incredibly rich source of data on family functioning in the wake of the Great Recession.

I focus on changes to scheduling in single-mother and two-partner households. I analyze the schedules of both working and non-working parents and partners, which allows me to address changes in work scheduling – in terms of type, duration, and variability – over time without succumbing to problems related to selection into employment that are common in research on working parents. In two-partner households I analyze the schedules of both parents jointly,

which allows for better understanding how families do and do not combine schedules. I employ sequence analysis and clustering methods to develop schedule typologies in both types of households. These methods present a superior alternative to the application of standard shift definitions; such definitions are both decreasingly representative of the schedules that individuals work and unhelpful in characterizing the working patterns of two-partner households.

# Background

## *Trends in Nonstandard and Unstable Work*

One of the defining features of modern employment, particularly for those at the bottom of the labor market, is the increasing use of techniques that shift risk from employers to employees (Kalleberg 2009; Lambert 2008). Fligstein and Shin (2004) trace these changes to the rise of a shareholder value outlook that emphasizes profit over firm growth and size. Kalleberg (2009, 2011), by contrast, argues that these changes arise from regulatory shifts in the 1970s and 1980s and the decline of organized labor. Collins and Mayer (2010) suggest that public policy aimed at those at the bottom of the labor market – particularly in the form of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) and its successors – has served to weaken the position of low-skilled employees vis-a-vis employers and allow the expansion of worker-unfriendly practices.

Regardless of cause, there is general agreement that the conditions under which Americans work have worsened over the last forty years.[1] One of the frequently-invoked signs of this worsening is change in the hours that employees work. Concern has been primarily directed toward two phenomena: nonstandard work scheduling and unstable scheduling. Nonstandard work scheduling typically refers to working a majority of hours outside of the traditional

"standard" day shift (often defined as 8 am to 6 pm). This definition, unfortunately, varies from study to study, which can make direct comparability of findings difficult. Unstable schedules are those which vary from week-to-week or day-to-day; they are characterized by the limited amount of advance notice that employees are given (to the point where they may be altered mid-shift) (Henly, Shaefer, and Waxman 2006). Workers with unstable schedules exercise little or no control over which hours they work.

Of these two, nonstandard work scheduling has been the subject of considerably more research. Presser (2003) found that roughly two-fifths of all American workers held some type of nonstandard schedule as of 1997. Such schedules are not evenly distributed across the labor market. Both Presser (2003) and Hamermesh (2002), working from Current Population Survey (CPS) data, found that nonstandard schedules are more common for men, less-educated workers, lower-paid workers, and minorities. Presser, in addition, showed that nonstandard work is clustered in the service and retail sectors. Workers tend to take these jobs not because they prefer nonstandard hours but because such an arrangement was a prerequisite of the job (or no better job was available) (Presser 2003; Presser and Cox 1997).

Nonstandard work schedules were not always so unevenly distributed. As Shulman noted, "Approximately one-third of Americans work night shifts, but while twenty years ago these shifts were fairly evenly distributed amongst high- and low-wage workers, today that has changed. More than 75 percent of cashiers, food prep workers, nursing aides, orderlies and attendants, retail sales, and waitresses work non-standard hours" (Shulman 2005:34). Hamermesh (2002) provided quantitative evidence that the burden of evening and night work shifted, between the early 1970s and the late 1990s, to those at the bottom of the income distribution.

It is widely assumed – but rarely demonstrated – that nonstandard work schedules have become more prevalent over time. If the sectors and jobs in which nonstandard work schedules are increasingly concentrated are growing, more individuals are likely to end up working such schedules. Presser and Cox make a case that rests on this idea. They identified retail and service occupations as major sites of nonstandard work for less-educated mothers in the early 1990s. They laid out an argument that these occupations were not only likely to become more common during the 1990s and 2000s (following Bureau of Labor Statistics projections), but were also likely to be landing places for women transitioning off of welfare in the years following passage of PRWORA (Presser and Cox 1997). Since Presser and Cox's paper relies solely on 1991 CPS data, however, they lacked the means to actually track the change over time.

Hamermesh (2002), by contrast, employed multiple waves of the CPS and presented evidence of a *decline* over the period 1973-1997 in the percentage of individuals reporting work in the evening and night (see also Hamermesh 1999). He writes that, "almost certainly contrary to popular belief, the best evidence suggests that evening/night work in the United States has diminished in importance since the early 1970s" (Hamermesh 2002:607). This suggests an alternative narrative in which nonstandard work has become more *concentrated* but not necessarily more *prevalent*.

Unstable scheduling has been the focus of considerably less research than nonstandard work scheduling. Analyses to date typically focus either on the locus of scheduling control (Gerstel and Clawson 2014; Lambert, Haley-Lock, and Henly 2012; McCrate 2012) or the consequences of unstable schedules (Dunifon et al. 2005; Henly and Lambert 2005, 2014; Zeytinoglu et al. 2004) rather than on the prevalence and correlates of such schedules. It is assumed that unstable schedules are a relatively new phenomenon – increasing in frequency as working conditions

deteriorate – and that they are most often found in the retail and service sectors. There is, however, little or no evidence to support these assumptions.

## *Methodological Shortcomings: The Problem with Selection*

One reason for uncertainty in trends in nonstandard and unstable scheduling is that methods used to date limit our ability to pursue analyses of change over time. One consistent factor in research on the prevalence and consequences of nonstandard and unstable work is the unit of analysis: workers. This sample is occasionally restricted (e.g., Hamermesh (2002) only analyzed those who worked 20 or more hours per week), but nearly all research on work schedules takes employment as a prerequisite. This is often a reasonable analytic strategy: when examining work scheduling, one should look at workers. It allows researchers to ask questions such as "which workers are employed nonstandard schedules?" and "is the prevalence of nonstandard shifts increasing among workers?"

This focus on employees, however, presents a fundamental selection problem. If analysis is carried out over the class of individuals who select into employment (i.e., workers), accounting for change over time becomes difficult. Consider a stylized example: 10% of all workers are found to have nonstandard schedules in year T and 20% have nonstandard schedules in year T+30. How much has the prevalence of nonstandard work changed? Among workers it has, of course, increased by 10 percentage points, but that answer fails to account for changes to the make-up of the labor force over the 30 year period. Within the full population, the overall percentage of individuals working such schedules may have decreased, increased, or remained stable. Likewise, analyzing the characteristics associated with nonstandard and unstable work based on a sample of workers forces us to ignore how those characteristics may be simultaneously related to selection into employment.

One solution to this selection problem would be to track the prevalence of nonstandard and unstable work among all *working-age adults* at multiple points in time. If we are strictly interested in individuals' own exposure to these schedules, such a solution would be effective. Often, however, our concern rests with exposure more broadly, and in particular how families and children are affected by nonstandard and unstable work schedules.

This then yields a second solution: track the prevalence of nonstandard and unstable work among all *households with children* at multiple points in time. This solves the selection problem identified above while simultaneously accounting for changing family and child exposure to these schedules. The new problem that emerges is one of measurement. Characterizing the schedules of lone individuals is relatively easy; doing so for households proves more complicated. The basic problem is multiplication in those households that include two partners: a j-category typology of schedules yields $j^2$ possible arrangements when applied to a couple. Even when j is small, this results in a cumbersome number of couple-level categories, many of which will be sparsely populated.

Research on work scheduling and family functioning has generally employed one of two approaches to two-partner scheduling. In the first approach, constituent family members are treated in isolation from one another and the experience of one family member – often the mother – is taken as the key indicator of interest. This approach requires a central assumption – that mother's schedule is independent of her partner's – that is exceedingly hard to justify. Even in the unlikely event that they are wholly irrelevant to children's well-being, work schedules of fathers and others in the household have the potential to mediate or exacerbate the processes linked to maternal scheduling. A household in which the mother works a nonstandard schedule and the father is a stay-at-home caregiver looks considerably different from that in which the

father is also working a nonstandard schedule. Analyses that depend solely on mother's schedule cannot account for the difference.

The second approach, which is an improvement on the first, is to focus on scheduling in dual-earner couples. This can take various forms. Presser, for instance, focused on the "when" of work, describing the joint frequencies of wife's and husband's shifts (Presser 1984, 1987, 1988, 1994; Presser and Cain 1983). Nock and Kingston (1985), by contrast, focused on within-couple schedule synchronization. Their insight was that two partners working eight-hour shifts can yield working schedules ranging from identical at one extreme to totally asynchronous at the other. They demonstrated that measures of total work and off-scheduling are associated with variations in household labor, childcare, and marital satisfaction.[2] This focus on the synchronization of dual-earner couple schedules has been revived in a number of more recent articles which have demonstrated that couples have more synchronized schedules than would be expected by random chance (Chenu and Robinson 2002; Hamermesh 2002). Lesnard (2008) offered the most recent notable analysis of dual-earner schedules. Using sequence and cluster analysis, he developed a typology of work schedules for French dual-earner married couples at two time points (1986 and 1999). Within each schedule type he described the work hours of husbands and wives and the synchronization of schedules, thus allowing a better understanding of when dual-earner couples work as well as how much joint leisure they enjoy. This approach serves to synthesize Presser's interest in timing with Nock and Kingston's focus on synchronization.

The analysis of dual-earner couples is, in short, well established. However, it suffers from the same selection problem identified above. Analyses of dual-earner families implicitly leave out single-earner couples and two-partner households in which neither partner is working. What distinguishes dual-earner households from other households in which neither or only one

member is working? Given that the rate of dual-earner households is shifting, comparisons over time are fraught. Are the changes that we see in scheduling in dual-earner households over time the result of changes in the labor market? Changes in how couples make decisions? Or are they related to the nature of the couples who are choosing to become dual-earners? Answering such questions without an understanding of the experience of all couples is problematic. If we are able to expand our samples to include these non-dual-earner two-partner households, however, the problems prove relatively simple to resolve.

## *Explaining Changes in Prevalence*

How has household-level exposure to nonstandard and unstable schedules changed over the last 25 years? What accounts for these changes? Any shifts in the prevalence of nonstandard and unstable work over time necessarily represent a combination of two factors: changes in the characteristics of the population or economy (more diversity, more education, more work in certain occupations, etc.) and changes to the relationships between these characteristics and the likelihood of nonstandard/unstable work.[3]

A number of studies have documented the characteristics of individuals who work nonstandard and, to a lesser extent, unstable schedules. There is broad agreement on at least two relationships. First, there is considerable evidence that the retail and service sectors – including health services – are key sites for both nonstandard and unstable scheduling (Gerstel and Clawson 2014; Presser 2003). Accountants rarely work at 3 am; cashiers and clerks at 24-hour pharmacies, gas stations, and grocery stores do. Second, less-educated individuals appear to be at greater risk of working nonstandard shifts. Both Presser (2003) and Hamermesh (2002) find protective effects of education even when controlling for industry. As with many other outcomes, it appears that education offers considerable rewards (Hout 2012), though Hacker

provides reason to believe that some of the protective effects of education in the labor market have diminished in recent years (Hacker 2006).

The U.S. has experienced the prolonged growth of the service and retail sectors (Lee and Wolpin 2006). Since the 1980s, the service sector has been the only area of employment growth for low-skilled workers (Autor and Dorn 2013). Even if the relationship between working in service/retail and nonstandard and unstable scheduling has not changed in the intervening years, we would expect to find more of these types of schedules. The assumption is that unstable work was relatively rare previously but has become widespread in these sectors in the last 30 years. These trends, combined with growth of the sector, should serve to exacerbate exposure to nonstandard and unstable work.

At the same time, the populace has become better-educated. High school and college completion rates have steadily increased over the last 30 years. The adult population is better-educated, and the prime working age segment of the adult population – those most likely to have children in the household – is better-educated than the population at large (Ryan and Bauman 2016). A more-educated population would seem to be less at risk of nonstandard and unstable work, unless the relationship between education and scheduling has weakened.

To answer the questions laid out at the beginning of this sub-section, I analyze the working schedules of American households with children under age 13 at two points in time: 1990 and 2012. Because scheduling dynamics are necessarily different in single-parent and two-partner households, I conduct analyses separately by household type. Because of the small number of single-father and same-sex two-partner households, I restrict analysis to single-mother and opposite-sex two-partner households. In accounting for observed changes I focus particular

attention on shifts to the occupational structure and the educational distribution and to changes to the relationships between occupation, education, and scheduling.[4]

## Data and Methods

This paper uses data from two nationally-representative studies of the supply of and demand for childcare. The first, the National Child Care Survey (NCCS), was conducted in late 1989 and early 1990. It consisted of five studies: a survey of parents with children under age 13, a survey of the childcare providers used by those parents, a separate survey of individuals who provided childcare in their homes, and two sub-studies of select parents: those with low household incomes (less than $15,000) and those in the military. I make use of the parent study and the low-income sub-study here; combined, these data were gathered from 4,777 households. These studies collected extensive data on the childcare arrangements that families use, the employment schedules of parents, and family characteristics. These surveys were conducted via computer-assisted telephone interviewing, making use of a version of random digit dialing (Hofferth et al. 1992b, 1992a).

The second data source is the National Survey of Early Care and Education (NSECE), which was carried out in 2012. The study was comprised of four surveys which collected data from households with children under the age of 13, center-based childcare providers, individual workers at those centers, and providers of both formal and informal home-based childcare. I make use of the household survey, which gathered data from 11,629 households from 755 communities across all 50 states and the District of Columbia. The survey collected data on many of the same topics as the NCCS, often with identical or near-identical questions. Data were

collected primarily via computer-assisted in-person interviews, though a minority were completed via computer-assisted telephone interviewing (Bowman et al. 2013).

Surveys that collect time-use data typically suffer from a number of restrictions. First, because of cost, complication, or respondent burden, there are few surveys that collect schedules from multiple adults in a household.[5] This inhibits researchers' ability to analyze co-scheduling behavior in two-partner households. Second, schedule data is typically collected either from a single specific day (as in the American Time Use Survey) or with reference to an abstract "usual" day (as in the May supplement to the CPS). Without repeated schedules covering multiple days we lack a way of assessing variability. Hamermesh acknowledges this second problem but writes that, "the ideal, a set of repeated cross-sections of a large numbers of time diaries showing exactly when people are at work for each of a number of days, is simply unavailable in the United States or elsewhere" (Hamermesh 2002:603). The NCCS and NSECE suffer from neither of these restrictions and, when combined, represent something approaching the ideal that Hamermesh lays out: each survey collected work schedule data for the respondent and their partner (if present in the household) for a full seven-day week.

In the NCCS, schedule data were collected from 914 single-mother respondents and from both partners in 3,489 two-partner households. In the NSECE, schedule data were collected from 2,777 single-mother respondents and from both partners in 7,169 two-partner households. In total this yields 25,357 person-weeks. To harmonize the data I simplified schedules such that each person-week was broken into 15-minute blocks and each block assigned to either a "work" or "other" state. These data form the basis of the analyses conducted here. It bears noting here that both surveys collected data from a single respondent, most often the mother of a child under the age of 13. Recall problems may pertain to such data, but they should be the same problems

across the two surveys. It also bears highlighting one significant difference in how these data were collected. In both surveys respondents were asked to report work start and end times, but in the NSECE they were instructed to include time spent commuting to and from work. Because there is no direct way of accounting for commuting time, I developed a method (described in Methodological Appendix A) to trim reported working hours in the NSECE on the basis of related covariates so as to make the two data sources more commensurable.

I make use of sequence analysis and clustering methods to describe and characterize these schedules. The most apparent alternative would be a simple categorization of schedules following traditional shift definitions (i.e., part- or full-time standard, evening, or night work). That option is unappealing for at least three reasons. First, as alluded to above, these traditional definitions are less settled than is commonly assumed; what exactly constitutes a standard or nonstandard shift varies from study to study. I have no strong grounds for choosing one of these definitions over the other. Second, there is compelling evidence – central, in fact, to much of the literature on unstable work – that these traditional definitions have become decreasingly good descriptors of the types of schedules that individuals actually work (Henly and Lambert 2005; Lein et al. 2005). Third, as noted above, such definitions do not facilitate characterizing two-partner households because they tend to yield a large and unwieldy number of combinations.

Sequence analysis and clustering, by contrast, allow me to derive the typology of schedules directly from the data without imposing any strong model of how work must be scheduled. These methods offer up more subtle ways of characterizing schedules and are more appropriate as employees work schedules that are decreasingly aligned with the traditional standards. Two-partner households pose no particular challenge given these methods. Supplementary analyses – available upon request – demonstrate that sequence analysis and clustering yield typologies of

work scheduling that perform better than those that result from traditional definitions by a number of metrics.

I use these schedule data to create separate typologies of work schedules in single-mother and two-partner households and to assess the day-to-day variability of working schedules in each. To do so I carried out a set of clustering exercises – first at day level and second at the week level – separately across all single mothers and all couples in the combined NCCS-NSECE sample. The steps involved are described in detail in Methodological Appendix A. The end result of this process is that each single-mother and each two-partner household is assigned a schedule type that reflects their working pattern over the full seven-day week (with different typologies for the two sorts of households).

Each household is also marked as having either a stable or a variable schedule across the observed week. This measure provides a simple indicator of within-week schedule variability: whether a given individual or couple works more than one type of schedule over the course of the observed seven-day period. It is important to distinguish this concept of within-week schedule variability from that of schedule instability more broadly. Schedule instability can be thought of as consisting of four components: within-week schedule variability, between-week schedule variability, advance notice, and employee control. An unstable schedule must display either within- or between-week variability; this variability must be paired with either limited advance notice or low control on the part of the worker to constitute an unstable schedule. This combination lies at the heart of schedule instability as a concept. A schedule that varies from day-to-day is far less pernicious when the worker has six weeks notice rather than only 48 hours. Likewise, a schedule that, for example, cycles between day and evening shifts is more manageable when the employee has control over when those different shifts fall. Within-week

schedule variability is the only one of these four components of unstable scheduling that I am able to effectively measure across these two surveys. While I believe it merits analysis, it is important that it not be misinterpreted as a direct proxy for schedule instability. I discuss the benefits and drawbacks of the measure in greater depth in Methodological Appendix B.

Once schedules are categorized, I analyze changes in prevalence between 1990 and 2012 in two ways. First, to explore changes in associations between the main independent variables of interest (education and occupation) and schedule type and variability, I carry out a series of logistic regressions. In these models I predict holding the given schedule type (e.g., a standard schedule) relative to holding any other schedule type.[6] In each of the single-mother models I include two main sets of predictors: mother's education and mother's occupation (both categorical variables). I include interactions between each of these predictors and the survey year (with the 1990 NCCS serving as the baseline; I also include the main effect of survey year). In two-partner households I include these predictors (and their interactions with survey year) for both male and female partners. For models predicting within-week schedule variability I include schedule type (and its interaction with survey year) as a predictor as well.

Second, and building on these regression models, I carry out an exercise in which I address a counterfactual: if the associations that we observe in the 1990 data between individual characteristics and schedule held for the 2012 population, what would the distribution of households across schedule types be? Would as many or more be working unstable schedules? To answer these questions I carry out a standardization exercise wherein I predict probabilities of cluster membership and unstable work in the NSECE data using regression estimates derived from the NCCS. Changes to the relationships between characteristics and work scheduling

account for the differences I then see between the predicted and the observed schedule distributions (Sandberg and Hofferth 2001).

All analysis is carried out in R. Sequence analysis is conducted using the TraMineR (Gabadinho et al. 2015), TraMineRextras (Ritschard et al. 2015), and WeightedCluster (Studer 2014) packages; weighted logistic regression is carried out via the survey package (Lumley 2016).

# Results

**TABLE 1 HERE**

Table 1 provides a description of the sample split by household type (single mother and two-partner) and survey (1990 NCCS and 2012 NSECE). All results presented here are weighted so as to be nationally representative of all households with children under age 13. The samples are, in many ways, quite comparable across time. In terms of the number of children, age of the youngest child, and total income (standardized to 2012 dollars), there are few notable differences in either single-mother or two-partner households between 1990 and 2012.

Larger differences emerge when we examine race and household make-up. There are fewer white and black single-mother households in 2012 than in 1990 and more that report being Hispanic or of another race. Likewise, respondents in two-partner households report being Hispanic or an other race more often in 2012 than 1990.[7] Some households include adults who are not themselves parents or partners of parents; these additional adults – relative to the children in the household – may be older siblings, aunts, uncles, grandparents, other relatives, friends of parents, or paying borders. Single mother respondents report the presence of these additional adults at far greater rates than do respondents from two-partner households, but the rate doubled

over time in both types of household. For single-mother households this was an increase from 18.6% to 36.1% of all households; for two-partner households it was a jump from 7.9% to 15.2%.

For the key variables of interest – education and occupation – we see large differences between the two periods. As expected, the NSECE respondents and their partners are considerably more educated than their counterparts from the NCCS. Modal education shifts across the board from a High School diploma to a college diploma. Employment in service occupations is on the rise between 1990 and 2012, especially for single mothers.[8] Among single-mothers we see a large increase, from 13% to 21.8%. Fewer members of two-partner couples work in the service sector, but within this household type rates have increased over time, especially for men.

It also bears noting that, based on the observed working week, part-time work (working less than 35 hours per week) has increased in prevalence over time. Among single mothers and male and female partners in two-partner households we see slight declines in the number of individuals reported to work zero hours in the observed week. Amongst those working some hours, however, the portion observed to work fewer than 35 hours per week expands dramatically. For women in both types of household there are nearly as many reported to fall below the 35 hour threshold as there are above it. Note that the measure of within-week schedule variability that I employ below implicitly controls for this expansion of part-time work; see Methodological Appendix B for analysis.

## *Single-Mother Households*

The first-stage clustering process described in Methodological Appendix A, when run over all single-mother person-days, yields seven schedule types.[9] Figure 1 presents state distribution

plots for each of these clusters. This type of plot gives the distribution of states ("work" and "other" in this case) in each 15-minute block; it can be thought of as a series of vertical bar plots run up against each other in chronological order. Take as an example the panel labeled "Evening." At 7:30 am nearly all individuals in this cluster are in the non-working "other" state. By 11:15 am a very small percentage (represented by the small red patch at the top of the plot) are in "work" status. At 3 pm (15:00 military time) a growing number of these cluster members are now working and by 6:45 pm (18:45 military time) functionally all are at work. The percentage working then tapers off toward midnight.

**FIGURE 1 HERE**

In the first cluster, "Non-Work," individuals spend all or very nearly all of their time in non-work status. What we would think of as traditional standard work is shown in the top right panel ("Standard": modal schedule of 8:30 am to 4:45 pm). There are three variants on this schedule: short days during standard hours ("Short"; modal work is 9 am to 2 pm); long days extending into the evening ("Long"; modal is work from 10 am to 7 pm) and standard schedules shifted earlier in the day ("Early"; modal 7 am to 3 pm). In what follows I often combine these three and refer to them as "Off-Standard." The final two types are nonstandard: "Evening" (modal 3:45 pm to 10:30 pm) and "Night" work (the modal schedule involves work from midnight to 7 am).

These seven day types in turn form the basis for the categorization of person-weeks (ASW of the seven-cluster solution is .77). Each week-level cluster is, as one would expect, heavily but not exclusively populated by days of the given type. For instance, many days in the week-level category "Early" are of the "Early" category, but there are also "Standard" and "Long" type days scattered throughout, as well as "Non-Work" (especially on the weekends).

Table 2 provides a detailed description of these seven person-week clusters. In both 1990 and 2012, the majority of mothers in these households fall into the "Non-Work" cluster (see Column 1). Among those who do work, the majority work either a "Standard" schedule or one of the "Off-Standard" variants. Both the "Standard" schedule and the "Early" variant have declined in prevalence between 1990 and 2012 (from 25.0% to 20.4% and from 13.4% to 9.4%, respectively), while the number of single mothers working long and short schedules has increased. The percentage of these women working nonstandard schedules – either "Evening" or "Night" – has increased from 3.6% to 5.6%; this change is driven by increases in evening work.

Table 2 provides two ways of describing these seven working schedules. The first are counts of the average weekday standard and nonstandard work hours and weekend work hours (Columns 2-4). By this metric, "Standard" and "Off-Standard" schedules in 2012 look slightly shorter than those in 1990. "Nonstandard" schedules, by contrast, involve more standard weekday hours (2.1 vs 1.7 hours) and more weekend hours (2.8 vs 2.4 hours) in 2012 than in 1990, though fewer weekday nonstandard hours (3.7 vs 5.6 hours). The other means of assessing these schedules is through counts of average non-working, part-time, and full-time days within each cluster (Column 5-7). Here we more clearly see declines between 1990 and 2012 across nearly all schedule types in the average number of full-time days worked and concomitant increases in the average number of non-working and part-time days.

The final entries in the table (Column 8) report on the percentage of person-weeks within the category that exhibit within-week schedule variability. The percentage of such cases increases in every category between 1990 and 2012. This is most striking amongst those working "Standard" schedules: only 12.9% of such individuals had any variability within the observed week in the 1990 data; that increases to 21.7% in 2012. The highest levels of variability are observed

amongst single mothers in the "Long" schedule group, over 40% of whom have more than one work schedule in the reported week in 2012.

**TABLE 2 HERE**

Table 2 provides evidence that nonstandard work has increased in prevalence and that single mothers' working schedules exhibit greater within-week variability in 2012 than they did in 1990. What accounts for these changes? To begin to answer that question, I conducted a series of logistic regressions assessing the correlates of nonstandard and unstable work and their change over time. In each regression the dependent variable takes on value 1 if the household holds the given schedule (or set of schedules) and 0 otherwise. For single mothers there were four such models, one each predicting membership in the "Non-Work" cluster, the "Standard" work cluster, the composite "Off-Standard" group, and the composite "Nonstandard" group. A fifth model predicts within-week schedule variability. Results from these five models can be found in Table 3.

**TABLE 3 HERE**

In these models the main effects describe associations between the given characteristic and the selected schedule type in 1990. For instance, we see that single mothers reporting a service occupation were significantly less likely (relative to their peers with administrative occupations) to hold a standard-type schedule (log-odds of -1.93, $p<.001$) in 1990. We can add that term to the log-odds of the associated interaction term to find that single-mothers holding a service occupation were still less likely (relative to their peers with administrative occupations) to hold a standard-type schedule in 2012 (-1.93 + 0.75 = -1.18). The key results are the interaction terms, however, which get at the significance of changes in the associations between 1990 and 2012. That 0.75 change in log-odds for single mothers working service occupations, for instance,

signals that service work is actually *increasingly* – and in this case marginally significantly – associated with standard schedules across these two periods. This is a counter-intuitive finding, as the general expectation is that service work is descreasingly associated with standard schedules over time.

A few results in Table 3 bear note. First, I find no significant associations between education and any of the schedule outcomes, either in the main effects or in the interactions. This is a surprising absence given that education has typically been found to be a predictor of work scheduling. Second, changes in associations between service work and scheduling are not in the expected direction. I find that, in 1990, those with service occupations were (relative to those with administrative occupations) significantly less likely to hold a standard schedule and significantly more likely to hold an off-standard schedule, a nonstandard schedule, and/or a schedule displaying within-week variability. These results are as expected. The interaction terms, however, all point toward zero. There is a marginally significant positive shift in association between service work and standard scheduling (discussed above) and significant negative shifts in association between service work and both off-standard scheduling and variable scheduling. The interaction term in the model predicting nonstandard work is also negative (-.443) but does not reach significance.

Building upon these results, I carry out a standardization exercise (Sandberg and Hofferth 2001). In Figure 2 I predict probabilities of both cluster membership and within-week schedule variability in the NSECE data using regression estimates derived from the NCCS.[10] Each schedule cluster and within-week variability has three bars associated with it. The first two present the observed frequency of the cluster in, respectively, the 1990 and 2012 data. The third column presents the expected frequency of the cluster or of observed variability in the 2012

population *if* the 1990 associations between education and occupation, on the one hand, and work schedule, on the other, had continued to hold. If the second and third bars are identical, that signals that observed changes are driven strictly by changes in population composition. If the third bar is significantly greater or lesser than the second, some association has changed.

**FIGURE 2 HERE**

The disparities between the actual and predicted 2012 frequencies are considerable. Between 1990 and 2012, the percentage of single-mother households in the "Non-Work" cluster increased by three percentage points. If the associations between education, occupation, and "Non-Work" from 1990 held for the 2012 population, that percentage would have *fallen* by the same amount, an overall swing of six percentage points. Membership in the "Standard" cluster shrank by 4.6 percentage points between 1990 and 2012, but based on rates from 1990 it should have *increased* by one percentage point. Off-standard schedules are slightly below the predicted rate in the population, but nonstandard schedules are higher than would have been expected given 1990 rates (5.6% vs. 3.5%). Observed schedule variability across all clusters increased from 8.3% in 1990 to 12.5% in 2012. Based on rates from 1990 it would have been predicted to only increase to 10.4%, 2.1 percentage points less than is observed.

Taken together, the results in Table 3 and Figure 2 suggest that the working bargain has deteriorated for single mothers: despite their increasing education, the rate of non-work has increased, the rate of standard work has declined, and the rates of nonstandard and unstable work have increased more than anticipated. Regression results provide some evidence of a de-concentration effect. Rather than nonstandard and unstable work being the purview strictly of those at the bottom of the educational ladder and the labor market, such schedules are becoming more common regardless of of education and occupation.

## *Two-Partner Households*

The categorization of two-partner households is somewhat more complex. Couple-level clustering of days results in seven groups.[11] These are:

1. Non-Work: neither partner works.
2. Dual Standard: both partners are working standard schedules.
3. Dual w/Female Shift: the female partner is doing some type of shift work (evening or night); the male partner works standard hours.
4. Dual w/Male Shift: the female partner works standard hours; the male partner does shift work.
5. Female Standard: the female partner works standard hours; the male partner doesn't work.
6. Male Standard: the female partner doesn't work; the male partner works standard hours.
7. Male Shift: the female partner doesn't work; the male partner does shift work.

Figure 3 provides state distribution plots of these seven clusters. Again, these plots provide, in each vertical strip moving left to right, the distribution of states within each 15-minute period in each couple-day, by cluster. Households in the "Dual w/Female Shift" cluster serve as an example. At 4 am, nearly 100% of such households have neither partner working; at 11 am, nearly all have the male partner working and the female partner not working; at 8 pm (20:00 military time), the situation is reversed and nearly all these households have the female partner working and the male partner not working. The switch from male to female work occurs between 2 pm (14:00) and 6 pm (18:00) as the percentage of households in "man only" work decreases and the percentages of "female only" work and "both" working increase.

**FIGURE 3 HERE**

These day categorizations in turn form the basis for couple week-level clustering (ASW of .662). Table 4 provides – following the model of Table 2 – a description of these seven clusters and the schedules of the constituent members.

**TABLE 4 HERE**

The most noteworthy changes between 1990 and 2012 are the increases (by 2.6 and 2.0 percentage points, respectively) in the "Non-Work" and "Dual w/Female Shift" categories and the decrease (by 2.8 percentage points) in the "Dual Standard" category. Average male and female working hours (Columns 2-4) are fairly stable in most of these categories (average male standard and nonstandard weekday hours decline in several while average weekend hours increase). In Columns 5-7 we see that the average number of full-time days worked declines for both partners in nearly all categories, while the average number of part-time days increases between 1990 and 2012. Within-week schedule variability increases in all clusters, including a 25.7 percentage point increase among households categorized "Male Standard." In short, the total percentage of two-partner households with a member doing nonstandard work increases over time, the average amount of weekend work being done by constituent members is on the rise, and within-week schedule variability increases in all seven clusters.

As with single-mother households, I carry out a series of logistic regressions predicting schedule cluster membership and within-week schedule variability. For two-partner households there are eight models, one for each of the seven schedule clusters and an eighth predicting within-week schedule variability. Results are presented in Table 5.

**TABLE 5 HERE**

Here I do find some of the expected associations between education and schedule characteristics. Couples with more-educated wives were less likely to fall into the "Male

Standard" cluster and marginally more likely to fall into the "Female Standard" cluster in 2012 (relative to 1990). More-educated male partners were associated with lower odds of male shift work (either the "Dual w/Male Shift" or the "Male Shift" cluster) and higher odds of membership in the "Male Standard" cluster in 1990; interactions with time are insignificant, suggesting stability in these relationships.

Households in which the female partners is reported to have a service occupation (relative to those in which she holds an administrative occupation) were significantly less likely to hold a "Dual Standard" or "Female Standard" schedule and significantly more likely to fall into the "Dual w/Female Shift" or "Male Standard" cluster and more likely to display within-week schedule variability. The interaction with time suggests a significant negative relationship between service work and the "Dual w/Female Shift" cluster, reducing the 2012 point estimate to, effectively, zero (1.5 + -1.41 = 0.09). Men's service work (again, relative to administrative work) was significantly negatively associated with the "Dual Standard" and the "Male Standard" clusters and significantly positively associated with both clusters that entail male shift work. There are no significant interactions with time, suggesting stability in associations between 1990 and 2012.

Again, these results present the opportunity to address the counterfactual of how cluster membership rates and observed schedule variability would vary from the observed frequencies in 2012 if the associations from 1990 continued to hold. Figure 4 presents the results of this standardization, following the same model as Figure 2.

**FIGURE 4 HERE**

The disparities between observed and expected frequencies of cluster membership in 2012 are smaller here than those found in single-mother households. The largest gap is in membership in

the "Dual Standard" category: based on 1990 rates we would predict membership in this cluster to increase by 1.5 percentage points between 1990 and 2012, whereas in reality it dropped by 2.8 percentage points (a 4.3 percentage point swing). For the other categories, observed and expected rates are often strikingly similar, and even where there are differences, they are mostly in the expected direction (e.g., female standard work was predicted to increase; the observed rate is slightly higher than the predicted). The one area in which the predicted and observed rates are in stark disagreement is within-week schedule variability. The associations from 1990 would lead us to predict a slight (0.5 percentage point) increase in variability over this period; in fact we observe a 7.6 percentage point increase in variability.

## Discussion and Conclusion

In this paper I have described the work schedules to which children under age 13 in single-mother and two-partner households are exposed. I have shown how exposure to these schedules has changed between 1990 and 2012 and analyzed changes to the correlates of these schedule types. The results present very different pictures of these two types of households.

For single-mother households, I find confirmation of many of the expected trends related to the decline of work. Between 1990 and 2012, the percentage of single mothers working standard schedules has declined while the portion working nonstandard, "Long," and "Short" schedules has increased. Within-week variability in work schedules has increased for women in all categories. These changes were not the result of shifts in the educational attainment or occupations of single mothers, but rather of changes to the associations between these factors and work scheduling. Under the counterfactual addressed in Figure 2, we would have seen fewer "Non-Work" single-mother households, less variable work, and more of these women working

standard schedules had associations from 1990 held in 2012. We observe the opposite in 2012. Interestingly, it does not appear that changes to work in service occupations are to blame. The evidence suggests that nonstandard, off-standard, and variable work schedules have become more common in this population regardless of education or occupation. This sort of de-concentration effect runs contrary to the expectation that such scheduling is increasingly sequestered in certain occupations (Hamermesh 2002). A positive interpretation of this finding is that those children whose single mothers are less-educated or in less desirable occupations are at no further disadvantage in terms of work scheduling than those whose single mothers are more-educated or hold better jobs. Given that this only comes about because *all* children of single mothers are increasingly at risk of exposure to nonstandard or unstable work, this conclusion is cold comfort.

For two-partner households, the changes from 1990 to 2012 are smaller. There are still noteworthy shifts in the frequency of some groups – particularly the increase in non-working households and the decrease in dual standard working couples – but overall the categories are fairly stable (and, per Figure 4, mostly close to what would be predicted on the basis of the 1990 associations). The exception is within-week variability, which is far more common in 2012 than 1990. It does not appear that the terms of employment – at least in terms of schedule type – have substantially worsened over this period. This finding is not out of line with Hamermesh's argument for a slight decline in nonstandard work (Hamermesh 2002) or Lesnard's findings in France of relative stability over time in the distribution of family workday types in dual-earner households (Lesnard 2008). On the other hand, within each of these categories the incidence of within-week schedule variability has increased. As with single mothers, the changes that we do

observe – especially the large increase in variability – cannot be attributed to changes in service occupations.

The data and methods employed here allow for an unprecedented glimpse into parental work scheduling and variability. Sequence analysis and clustering methods provide a parsimonious description of work schedules in both single-mother and two-partner households. Many of the schedule types described here fall outside the bounds of traditional shifts. Amongst single mothers, for instance, identification of the three "Off-Standard" schedule types – all of which would be subsumed within the category of standard work in a traditional shift definition – is in and of itself a significant finding. The NCCS and NSECE provide enormously rich sources of data on work scheduling. To have schedules of actual hours worked (rather than just abstract or "usual" shifts) is good; to have such data for multiple members of a household is rare; to have all of that for seven consecutive days is remarkable.

That being said, this study has its share of limitations. First, I exclude single-father and same-sex two-partner households. Such households are important and deserving of analysis as patterns may differ from what we see in single-mother and heterosexual two-partner households. It would be interesting to know, for instance, whether the working schedules of single fathers more closely resemble those of single mothers or of men in two-partner households. Unfortunately, they are simply not sufficiently represented in these data to allow analysis. Second, these data only allow me to analyze schedule instability indirectly. As discussed above, my measure of within-week variability assesses observed day-to-day variation in schedule worked. I discuss this problem in greater depth in Appendix B. Third, the schedules that I describe above are a function of the data that I have available; they derive from the schedule data in the NCCS and NSECE and are thus unique to these data. I expect that additional data from similar sources would yield

similar clusters, but the analysis does not – nor should not be interpreted as – producing a new set of shift definitions that are meant to be applied elsewhere.

Fourth, the data that I draw from here allow for comparison of working schedules in 1990 to those in 2012, but do not allow for identification of a strong trend line. It is possible, for instance, that nonstandard work – and the associations between service sector employment and nonstandard work – increased significantly over the 1990s and early 2000s but weakened following the Great Recession. Given a range of economic and policy changes, it would be a mistake to draw simple trend lines between data points in these two surveys. Having one additional data point following passage of PRWORA and preceding the 2007 financial crisis would allow for some interesting analyses of that possibility and others. There is, unfortunately, no such data that I am aware of that meets the necessary criteria for comparability. Nonetheless, two data points – and these two data points in particular – do make for an important comparison. It is worth noting the similarities between the two periods: the U.S. was not in a recession during data collection on either survey and the national unemployment rate was only slightly lower in 1990 than in 2012 (5.6% vs 8.1%) (Bureau of Labor Statistics 2017). The 2012 data, moreover, allow us a glimpse into the state of employment at the outset of what may well be a new economic period: a relatively weak, jobless economic recovery with limited policies or programs aimed at protecting workers' rights. In short, while this analysis does not allow for investigation of trends between 1990 and 2012, the comparison nonetheless offers a snapshot of the changed employment landscape for American parents and the inclusion of post-2008 data is a boon for analysis of family functioning in the present day.

These data and methods also open up a range of additional topics for investigation. How have these changes in work schedules affected the types of care that children receive? Given childcare

calendars in both the NCCS and NSECE, I intend, in future research, to track changes in both the types of care used, the extent of time children spend in such care, and the quantity of parental care provided. Previous research on children's time with parents has operated primarily from the child's point-of-view; analyzing child and parental schedules simultaneously allows us to better understand the decisions that families make about work, care, and leisure.

## *Conclusion*

This paper explores how the work schedules of parents in single-mother and two-partner households have changed over the last quarter century. In analyzing the schedules of all parents – working and not – I provide a complete picture of the types of schedules to which children in these households are exposed. I develop and and make use of a typology of joint schedules in two-partner households, one that avoids the selection problems that have befallen previous attempts to analyze work schedules in such families. The data – which include seven days worth of schedules from the key household member(s) – provide an unprecedented look at parental work scheduling and its variation. Combining the NCCS and NSECE offers an opportunity to examine schedule change over a period in which work has become more precarious for many workers.

The picture that emerges is bifurcated. The situation in single-mother households appears to have worsened, despite a number of factors that would lead us to expect otherwise. More single mothers are not working, and those who do work fewer standard schedules and more nonstandard, irregular, and variable schedules. From a stratification standpoint, such a conclusion is disheartening. It appears that children in single-mother households, at a disadvantage for a number of reasons, are also more likely today than they were 25 years ago to have a mother who does not work standard hours or whose working schedule varies over the

course of the week. If, as a growing body of research has shown, nonstandard and unstable schedules take a toll on parents and children alike, then these already-vulnerable children are likely to experience further hardship as a function of their parents' work.

In two-parent households, by contrast, the comparison of 1990 and 2012 yields fewer noteworthy differences. The exception is in schedule variability, which has increased in all schedule types. The distribution of schedule types is relatively stable across the 22-year gap, although a slightly higher percent of households do fall into one of the clusters that includes nonstandard work schedules. This is a somewhat more hopeful finding, and one that is somewhat surprising given expectations of the decline of work. Understanding how those in two-partner households have avoided increasing nonstandard work while single mothers were unable to do so represents an important avenue for further research.

## *Notes*

[1] Descriptive and public interest research draws attention to declines in benefits and employee tenure, increases in unsafe working conditions, limited legal protections, low unionization levels, rigid and tightly monitored schedules, severe forms of oversight and control, stolen wages, forced and/or unpaid overtime, illegal dismissal, non-guaranteed minimum hours, and changes in work scheduling (Collins and Mayer 2010; Doussard 2013; Kalleberg 2011; Lambert 2008; Lein et al. 2005; Shulman 2005). In addition to nonstandard and unstable work scheduling, analyzed in depth here, split shift scheduling is an area of increasing attention in the work scheduling literature.

[2] To Nock and Kingston's credit, they also attempted to analyze differences in these relationships between single- and dual-earner households (Kingston and Nock 1987; Nock and Kingston 1988), but in these cases the treatment of work scheduling either dropped out of analyses or became exceedingly cumbersome.

[3] Change could be attributed entirely to one or the other factor (i.e., entirely to demographic/economic changes or entirely to changes in the relationships between those characteristics and work scheduling). In practice, the result is likely to fall somewhere between these extremes.

[4] It is worth acknowledging variability in employee preferences. For any number of reasons, some parents may elect to take work at nonstandard hours. Such work could plausibly allow parents to reduce reliance on non-parental care or could be sufficiently better-compensated to make it worthwhile. For couples in which joint leisure is relatively less valuable than availability of parental care, desynchronized work schedules (with one partner working evening or night) may be a satisfactory equilibrium. My goal is not to evaluate the benefits or drawbacks of such

decisions. In investigating the changing associations between education, industry, and work scheduling, as I do below, I implicitly assume stability in parental preferences over time. I am aware of no evidence suggesting changes in such preferences over time.

[5] The time-use data that Lesnard (2008; 2009) used represent an exception, but those data are from France and suffer from the other common restriction: they are limited to a single day. The American Eleven-State Time-Use Survey 1977-78 is another exception, but in that study schedules are only collected from two days per family.

[6] The alternative is multinomial logistic regression with schedule type entered as a categorical dependent variable. Both are unwieldy, but interpretation this way is somewhat simpler. Also, it is not clear that the Independence of Irrelevant Alternatives assumption is supportable for this outcome measure, making a multinomial logistic regression model suspect. I have nonetheless tested such models and find substantively similar results.

[7] In the NCCS, race was collected only for the respondent. In the NSECE, race was collected for the respondent and all children in the household, but not for adult household members other than the respondent. For comparability, I report here and throughout on just respondent's race (disregarding sex of respondent in two-partner households).

[8] Occupation is a simplified, condensed version of the standard 1990 Census occupation categories. These classifications changed dramatically in the late 1990s, which make translation between older and newer systems difficult. I make use of the Integrated Public Use Microdata Series' well-validated recoding of current Census categorizations back to the 1990 standard (which was the basis for the categorization in the NCCS data). Anyone who was not working in the previous week is categorized as having no occupation recorded; in the NCCS, occupation and industry variables were not collected for these individuals. Individuals were allocated into the

five other categories per standard occupation classifications with one exception: those working as cashiers were set as "Service" rather than "Technicians/Support/Sales."

[9] Silhouette width is a measure of the tightness and seperation of clusters; it runs on the interval [-1,1]. Average silhouette width (ASW) allows for evaluation of overall clustering validity. The ASW of these seven clusters is .74, which suggests that a strong structure has been identified (Rousseeuw 1987; Studer 2013).

[10] Figure 2 and Figure 4 are based on regressions that include only education and occupation. I have conducted analyses that include a full set of controls – age, race, number of children, age of the youngest child, and presence of other adults in the household – and results are nearly identical. I have also tested interactions between education and occupation; inclusion of the interactions is not supported by goodness-of-fit tests and does not substantively alter results.

[11] In practice, Ward's Minimum Variance method outperforms PAM with these data. After examining the clusters and fit statistics, I chose to output 10 clusters and then aggregate several, reducing the final number of clusters to seven. Statistics presented below are for the seven-cluster solution. ASW of the seven-cluster solution is .589.

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# Methodological Appendices

## *Appendix A: Schedule Data and Analysis*

In this appendix I provide a detailed discussion of how schedule data were collected in the NCCS and NSECE. I then describe the process that I followed to develop schedule typologies on the basis of these data. The level of detail provided is likely too great for the general reader but should prove helpful for those interested in replicating or extending this study.

In the NCCS, the respondent was asked how many jobs they currently work. For each job, starting with the one in which they reported working the most hours in the previous week (Monday through Sunday), they were asked which days they worked in that previous week. The interviewer then asked what time they began and ended working on each of those days. The respondent was allowed to report two shifts per day per job, and reports on up to three jobs. Multiple shifts are rare. For instance, roughly 52.5% of respondents report the start time for a first shift on Monday, but only 0.31% report the start time of a second shift. Likewise, few respondents have multiple jobs. Of the 59.4% of respondents who report paid employment, 92.5% have only a single job. Respondents are then asked an identical set of questions about their spouse or partner, if present in the household.

The NSECE schedule data collection was somewhat more complicated. The respondent was asked if, in the last week, they did any work for pay; attended classes in a high school, college, or university; or attended any courses or training programs intended to help find a job, learn a skill, or learn a job. For each day of the previous week they were then asked if they participated in each of the reported activities (if any); there was no limit on the number of work, school, or training shifts reported in each day. The respondent was allowed to report that a given day of the

week was identical to a previous day – thus reducing respondent burden – but if they did so they were asked a follow-up question confirming that the chosen day was indeed identical to the previously-described day. This set of questions was then repeated for the respondent's spouse (if present in the household), any other parent of a child under age 13 in the household, and any other household members who provided more than five hours of childcare in the previous week. Respondent fatigue is a concern here because this section comes after a similar, potentially more complex, childcare calendar section of the survey. The survey instrument was programmed to check parental work schedules for duplicated periods and to check against previously-collected childcare schedules for any periods of one hour or more in which children were not reported to be in care and parents were at work, school, or training. In such instances the respondent was prompted for more detail. It does not appear that the NCCS instrument included such checks.

The first difference between these two approaches is in the content of schedules. The NCCS functionally divides time into two categories: work and non-work. The NSECE allows for more states: work, school, training, and unclaimed time. For the sake of comparability, I was forced to collapse the school, training, and unclaimed categories in the NSECE into non-work (henceforth labeled "other").

The second difference is in the number of individuals whose schedules are recorded. In the NCCS, schedules are gathered only for the respondent and the spouse/partner; schedules for additional household members may be collected in the NSECE (if there are additional parents in the household or if other household members provided care in the previous week). Again, for the sake of comparability, I am forced to limit the NSECE responses; I cull all schedules that are not specific to the respondent or their partner.

Third, as discussed in the main text of the article, respondents to the NSECE were instructed to include time spent commuting to and from the given activity (work, school, or training) as part of the activity itself. There is no way to easily disentangle commuting time from working time, nor any way to confirm whether or not respondents to the surveys systematically followed the prompt to include commuting time. NCCS respondents were not instructed to include commute time in their responses nor does that survey collect data that would allow the analyst to add commuting time on to existing work reports.

Because the introduction of commuting time in the NSECE leads to a basic problem of comparability with the NCCS, I trimmed working schedules in the former by taking into account three related variables: how far the individual's place of employment is from home (where individual is either the respondent or, as appropriate, the respondent's partner); the urbanicity of the area where the household is located; and whether the household has a car. Working off of American Community Survey numbers, I developed a simple rule to determine how much time to trim from the start and end of working periods. Table A1 provides the numbers for households with a car; for those without a car I doubled all times. The resulting mean estimated commute among workers is 22.5 minutes, which is close to the 2009 national mean of 25.1 minutes traveled to work (McKenzie and Rapino 2011).

**TABLE A1 HERE**

Finally, fourth, data from these two studies are also stored differently. In the NCCS files these data are stored as collected: as start and end times by shift and job. In these NSECE they are stored as 15-minute blocks: each household member for whom a schedule was collected has a vector of 15-minute blocks starting from 12:00-12:14 am Monday and ending with 11:45-11:59 pm Sunday (15-minute blocks over a 7-day week results in 672 entries). Each block can take on

one of four values: "work," "school," "training," or "no work/school/training" (essentially an open block). The blocks can also take on a "don't know/refused" status, but this is exceedingly rare, occurring in only 0.04% of all blocks across all schedules collected. I recoded these as open blocks. This states-sequence format is ideal for sequence analysis; I reformatted the NCCS to match. Because shifts in the NCCS were not constrained to 15 minute intervals, I was forced to round starting and ending times to the nearest quarter hour.

I place three restrictions on the data. First, I limit single-parent households to those headed by a woman. Second, I only include heterosexual two-partner households. The exclusion is driven by the extremely small number of single-father and same-sex couple households available for analysis. For data quality reasons, I also remove 73 cases across the two samples where either the respondent or the partner is listed as having worked the entirety of at least one 24-hour day. I then modified both data sets such that each individual had seven day-level (96-block) sequences rather than one week-level (672-block) sequence. Once harmonized, I merged the two datasets.

As noted above – and given these restrictions – schedule data were collected from 914 single-mother respondents and from both partners in 3,489 two-partner households in the NCCS. In the NSECE, schedule data were collected from 2,777 single-mother respondents and from both partners in 7,169 two-partner households. Given that each individual has reports for seven days of the week, the combined 25,007 respondents and partners yield a data set with 175,049 lines (= 25,007 weeks x 7 days/week). This in turn yields (175,049 lines x 96 blocks/line=) 16,804,704 total cells, of which 15.6% are work blocks and the remaining 84.4% are non-work blocks. As a point of reference, there are 168 hours in a seven-day week. Someone working 40 hours per week would spend 23.8% of their total weekly time at work.

Figure A1 is a sequence index plot that visualizes a selection of these data. It presents, as a set of horizontal bars, a simple visualization of the vectors of work and non-work for six selected person-days. In this case, each of the selected days is a Tuesday; time runs left-to-right from 12 am through 11:59 pm (23:59 military time). The bottom-most individual (individual 1) did no work on this particular Tuesday and thus all 96 of their 15-minute blocks are set to "other." Individual 2, by contrast, worked from 7:45 am to 4 pm (a standard work day, albeit one that both started and ended slightly early). Individual 3 worked an extended standard day, arriving to work at 6 am and staying through to 5 pm. Individual 4 also worked during standard hours, but only three and a half hours total. Individual 5 worked slightly less (two and a half hours) and in the evening (6-8:30 pm). Finally, the top-most individual shows the classic signs of working the evening/night shift: he or she reports having started work at 12 am (the shift in fact started on Monday evening) and their shift ends at 6 am. They then report work starting back up at 6 pm and running through the end of the day (the shift continues in the Wednesday report).

**FIGURE A1 HERE**

To analyze these data I make use of a set of sequence and cluster analysis tools. I begin by running a variant of Optimal Matching (OM) over all person-day reports from single mothers. OM yields a measure of how dissimilar each sequence is from every other sequence; given n sequences it produces an n x n symmetrical matrix (called a dissimilarity matrix) wherein each (i,j) off-diagonal entry is the dissimilarity between sequence i and j. Functionally, it provides the "cost" of transforming – through insertions, deletions, and substitutions – any one observed sequence into another observed sequence. More similar sequences cost less to transform into one another whereas such transformation is more "expensive" between dissimilar sequences. The costs associated with each substitution are presented as a substitution-cost matrix which is

generated using either theory, intuition, the observed transition rates between the various states, or some combination of those methods (Abbott 1995; Abbott and Tsay 2000; Aisenbrey and Fasang 2010; Elzinga and Studer 2015). Following Lesnard (2008, 2010), I employ Dynamic Hamming Distance (DHD) matching, a variant of OM in which the cost of transitioning between states varies with time. Rather than rely on a single substitution-cost matrix (as in standard OM), there is one for each contiguous pair of blocks. Functionally this means that the cost of substituting "non-work" for "work" at 9 am (when such a transition is relatively common and thus "cheap") will be different than doing so at 9 pm (when the transition is rare and thus "expensive"). DHD matching is well-suited to a time-varying process like employment. It is also worth noting that DHD matching relies solely on substitutions and does not allow insertions or deletions. Given that all sequences in these data are of equal length, this poses no serious problem. In addition to the papers cited above, those interested in the particulars of DHD matching and its use should refer to Lesnard and de Saint Pol (2009); Raab et al. (2014); Fasang and Raab (2014). To establish the multi-dimensional substitution matrix I rely solely on the transition rates between states at each point in time.

Because of the number of comparisons involved, OM can be a computationally intensive process. To streamline it, I aggregate such that each unique person-day appears only once in the data and weight these cases according to their frequency. The 25,837 total person-days from single mothers are reduced to 1,192 unique lines; each line represents, on average, 21.7 person-days (minimum of 1, maximum of 16,450). I carry out DHD matching on these unique lines. Because the process takes into account the frequency weights associated with each unique sequence, the multi-dimensional substitution cost matrix that results is identical regardless of whether it is produced with the full or the aggregated data set.

I use the resulting dissimilarity matrix and employ the non-hierarchical Partitioning Around Medoids (PAM) algorithm to derive clusters from the data. Studer (2013) makes a strong case for PAM, which seeks to maximize a global rather than local criterion, as an alternative to hierarchical clustering. I have, however, tested alternative clustering options: Ward's Minimum Variance Method and the Weighted Pair Group Method with Arithmetic Mean (WPGMA, which is advocated by Lesnard (2008)). The former derives very similar clusters with slightly lower average silhouette widths; I in fact use the Ward clusters as the initial medoids in the PAM algorithm. WPGMA, by contrast, yields lower-quality and often quite sparse clusters. This process results in each person-day being allocated to a cluster; the reader should refer to Figure 1 and associated text for description of these day-level clusters. The final selection of clusters involved weighing both fit statistics and the descriptive potential of each additional group. This is, admittedly, a somewhat subjective process, but a necessary one. Adjudicating number of clusters by fit statistics alone would frequently lead to a clearly-inadequate two-cluster solution: workers and non-workers. I attempted to select more clusters where (a) the additional cluster offered a qualitatively new pattern relative to those already selected and (b) the additional cluster did not result in significantly worse average silhouette width across all clusters

I then re-configure the data into a week format; each single mother has a sequence of seven days where each day is represented by the cluster to which it has been assigned in the previous step. I run a second sequence analysis and clustering exercise, again using the PAM algorithm, across this set of 3,691 person-week sequences. The end result is to categorize each individual's week. Figure A2 provides state distribution plots that correspond to the seven week-level clusters for single mothers. As is evident, each week-level cluster is primarily but not exclusively made

up of days of the associated type; weekends are particularly likely to be non-working regardless of cluster.

**FIGURE A2 HERE**

I then turn to the 10,658 two-partner households. Returning to the person-day format, I set each 15-minute block to one of four statuses: neither partner working, only the female partner working, only the male partner working, or both partners working. Following the same model as above, I derive a time-varying substitution matrix, aggregate lines (yielding 8,786 unique couple-day sequences), output a dissimilarity matrix via DHD matching, and then derive clusters of couple-day schedules. I again re-configure these into a week-level format where each couple's week is represented as a sequence of clusters; I perform a second sequence analysis and clustering across these sequences to derive a categorization of couple-weeks. Figure A3 provides state distribution plots that correspond to the seven week-level clusters for two-partner households.

**FIGURE A3 HERE**

The week-level specification – of both individuals and of couples – allows me to observe the extent of variability in schedule type across days. I record the total number of different work-type clusters that a given individual or couple falls into over the course of the observed week (i.e., the count of unique clusters omitting the non-work cluster). I mark individuals/couples as experiencing within-week schedule variability if they experience more than one working schedule over the course of the seven-day sequence. This measure is discussed in greater detail in Methodological Appendix B.

Within each person-week I also calculate how many standard hours (8 am - 5:59 pm, Monday through Friday), nonstandard weekday hours (12 am - 7:59 am; 6 pm - 11:59 pm, Monday

through Friday), and weekend hours (at any hour, Saturday and Sunday) each individual works. I also designate each day as either non-working (if no work was reported), part-time (if less than seven hours of work are reported), or full-time (if seven or more hours of work are reported). These measures are used in Tables 2 and 3.

Finally, it bears noting that the NCCS and NSECE were collected over slightly different periods. The NCCS was collected between October, 1989 and June, 1990; the NSECE was collected between January and June, 2012. In both cases the majority of cases were collected between January and April. I carried out a series of regressions to check whether month of interview was a predictor of week-level schedule cluster in either single-mother or two-partner households. In neither case did I find any evidence of seasonality in work schedules. Analyses are available upon request.

## *Appendix B: Schedule Variability*

Unstable schedules – those that vary from day-to-day or week-to-week or that may be changed in the course of a shift – have the potential to be more disruptive than nonstandard shifts. A predictable nonstandard shift can be planned for; an unpredictable working schedule may make organizing other arrangements (including childcare) especially problematic (Bohle et al. 2004; Gerstel and Clawson 2014; Henly et al. 2006; Zeytinoglu et al. 2004). In this paper I am unable to offer a measure of schedule instability that gets at all four components instability that have been highlighted in the literature: worker control, advance notice, and within- and between-week variability. I am able to measure only within-week schedule variability: are individuals or couples working the same type of schedules each working day or do their working schedules vary? To do so, I count the number of unique work-type schedules (omitting non-working days) over the seven observed days. Individuals or couples who take on more than one unique

working-type cluster are marked as holding variable schedules. This definition raises two questions. First, how is this measure of within-week schedule variability related to other components of schedule instability? Second, is this measure driven by part-time employment?

To answer the first question, I explore the relation between within-week schedule variability several questions from the NCCS and NSECE. In both surveys, work schedules are complemented by questions on schedule variability. Unfortunately, these are not the same questions. In the NCCS, respondents are asked (of each job), "Do you usually work the same or fixed hours every week or do your hours vary from week to week, such as rotating from days to evenings or nights?" An equivalent question is asked of their partner's schedule (as appropriate). In the NSECE they are asked, "Did (you/she/he) work (your/his/her) usual schedule last week, is there no usual schedule, or was last week's schedule not the usual one?" These two questions can both be understood as measures of between-week variability. There is an additional question in the NSECE that asks the respondent how far in advance they (or the other individual whose schedule they are describing) usually know what days and hours they will need to work. Neither survey includes any questions on worker control over their schedule.

I cross-tabulate within-week schedule variability with self-reports from these three questions. If my measure is indeed capturing something about schedule variability, I would expect that those who I categorize as having variable schedules would be more likely to report that they work varying schedules (in the NCCS), that they have no usual schedule or that last week's was not usual (in the NSECE), and that they have less advance notice of scheduling (in the NSECE). From the NCCS I developed a variable that indicates whether the respondent reports schedule variability in any of their or, as appropriate, their partner's (up to three) jobs. For two-partner households I combine responses to these three questions across partners: a household is marked

"yes" if either partner reportedly works a varying schedule; any report of "no usual" schedule takes precedence, followed by any report of an "unusual" schedule; I took the minimal category of advance notice between the two partners. Results are displayed as column percentages in Table A2, separating single mothers from two-partner households.

**TABLE A2 HERE**

In the NCCS, households marked as having within-week schedule variability are far more likely to report between-week variability in hours. Single mothers displaying within-week schedule variability are over three times as likely to report between-week variability as those with no within-week variability. The difference is smaller in two-partner households, but the absolute percentage of such households with within-week variability also reporting at least some between-week variability (53.7%) is actually higher. That is noteworthy especially because the overall level of within-week variability is higher in two-partner households.

In the NSECE only 26.1% of single mothers who I categorize as having within-week stable schedules report either "No Usual" or an "Unusual" week, whereas fully 50% of those with variable schedules do so. The results are in the same direction for two-partner households. 42.9% of single mothers displaying within-week schedule variability report having less than a week of advance notice of their schedule, compared to 26.6% of their peers with stable schedules. Two-partner households with within-week variability are also more likely to report less advance notice on schedule.

These results generally support the idea that this measure of within-week schedule variability is related – in expected ways – with other components of schedule instability. Those with within-week variability in their schedules do self-report *more* of the factors that characterize unstable or contingent work than their counterparts with observed stability in schedule. But it is also clear

that it would be a mistake to treat within-week variability as a direct proxy for schedule instability. 13.9% of single mothers and fully 37% of two-partner households displaying within-week stability in working schedules reported in the NCCS that their working schedules varied from week to week. That sort of between-week variation should be accounted for in measuring instability. At the same time, 56.8% of single mothers and 46.3% of two-partner households with within-week variability *do not* report between-week variability. It may not be appropriate to include these significant sub-populations in any analyses of schedule instability.

The second question posed above was whether within-week variability is driven by part-time employment. If this is the case, then the increase in within-week schedule variability that we observe between 1990 and 2012 may simply be a function of the across-period growth in part-time employment noted in Table 1. To check this possibility, I cross-tabulated weekly working hours (none, less than 35, or 35 hours or more) and within-week variability. The results are in Table A3, split by household type (and member) and year, presented as row percentages.

**TABLE A3 HERE**

Amongst single mothers working some hours in 1990, the difference in within-week variability between part-time and full-time workers was 3.3 percentage points (a non-significant difference according to a weighted chi-square test). By 2012 this gap had expanded to 5.7 percentage points (marginally significant at p=.084), but, interestingly, it is full-time workers who demonstrate greater within-week schedule variability.

In two-partner households there is no significant difference in either 1990 or 2012 in the prevalence of within-week schedule variability (measured at the household level) by men's part-time/full-time status. Two-partner households in which women work part-time, however, are significantly more likely than those in which women work full-time to display within-week

variability (51.6% vs 26.6% in 1990, 53.9% vs 37.5% in 2012). This provides some cause for concern. However, a simple logistic regression model predicting household within-week schedule variability on the basis of (1) a dummy variable for survey year (1990 as the reference group), (2) a dummy variable for female part-time work (with female full-time as the reference group), and (3) the interaction between these two provides some further illumination (results available upon request). Both survey year (being in the 2012 sample) and part-time work status significantly increase the odds of household within-week variability. The interaction, however, is significantly negative, suggesting a weakening of the association between female part-time work and schedule variability in such households. While female part-time work is associated with within-week schedule variability in two-partner households in 2012, the association between those variable has at least weakened over time as female part-time employment has increased. This suggests that the rise in schedule variability in such households cannot be attributed to increasing part-time work alone.

# Figures

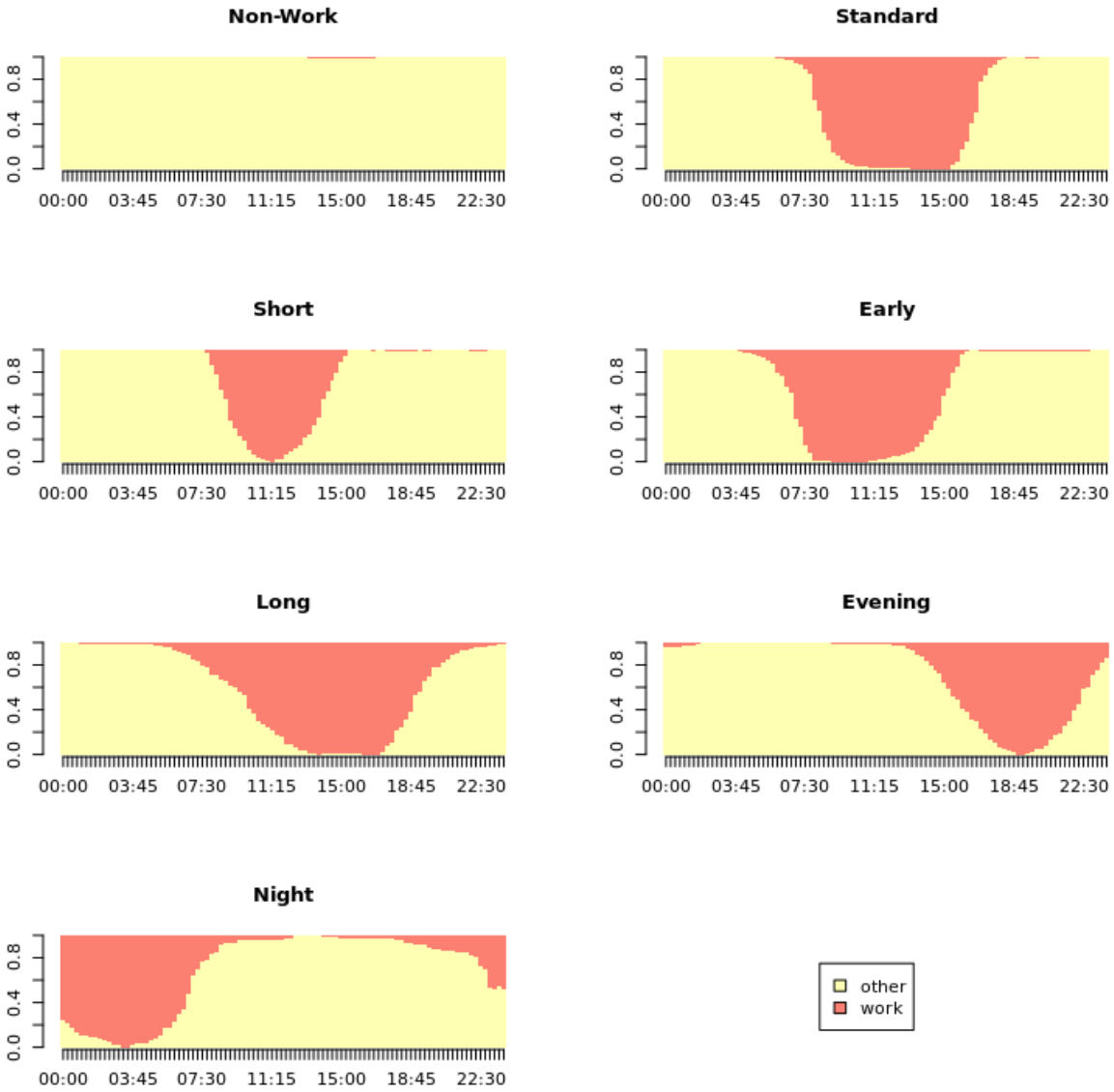


**Figure 1.** State distribution plots of person-day work schedules.

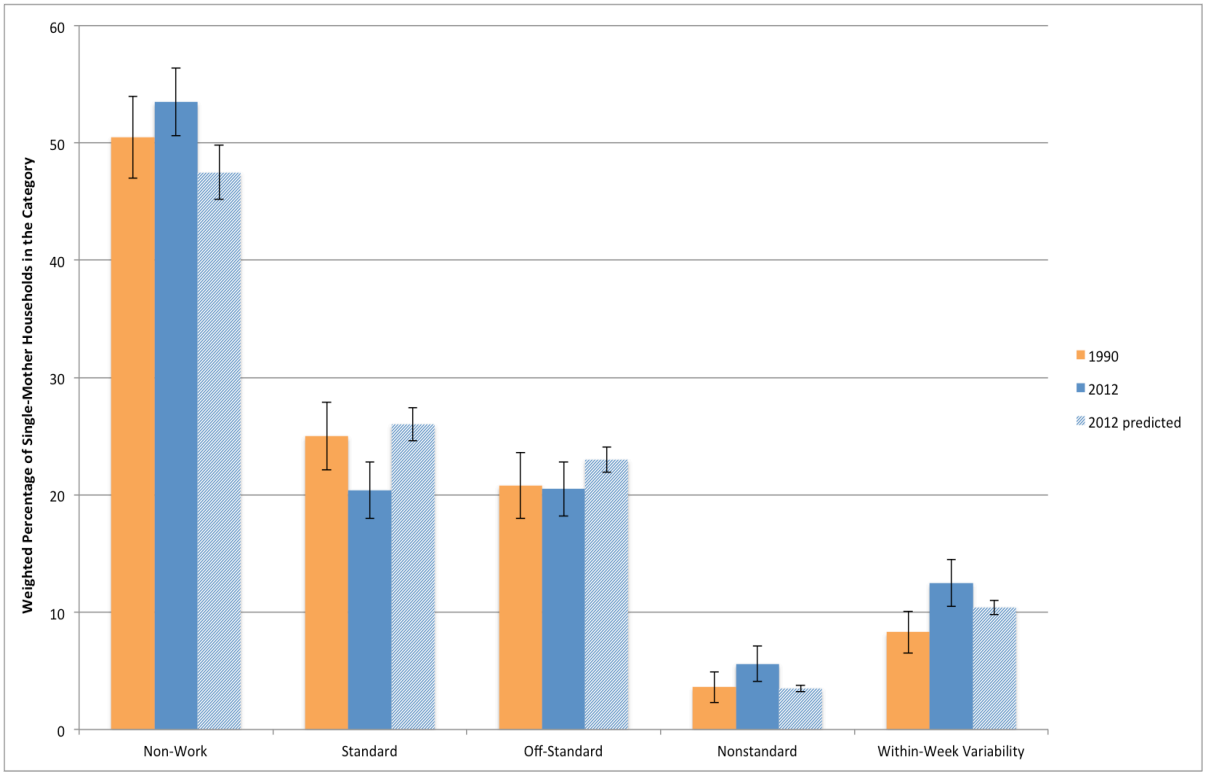


**Figure 2.** Comparison of work schedules in single-mother households, by year.

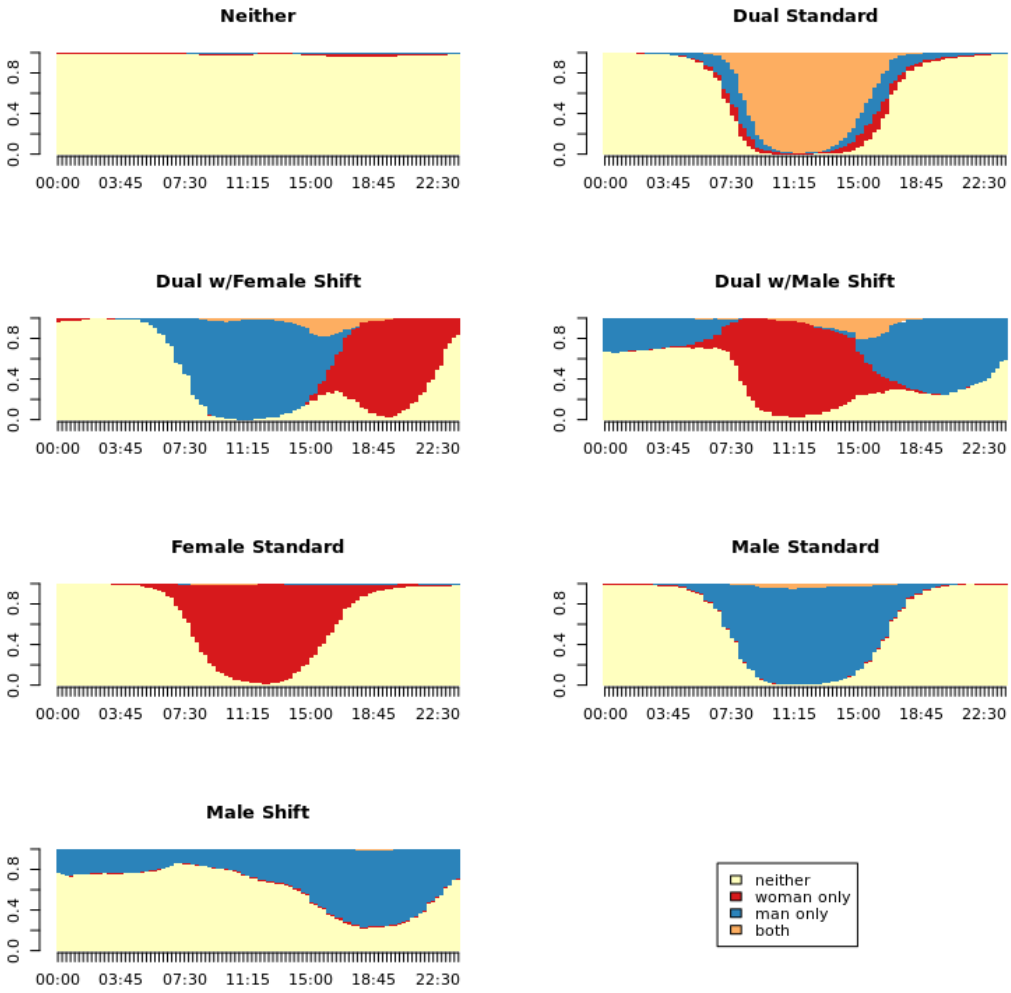


**Figure 3.** State distribution plots of couple-day clusters.

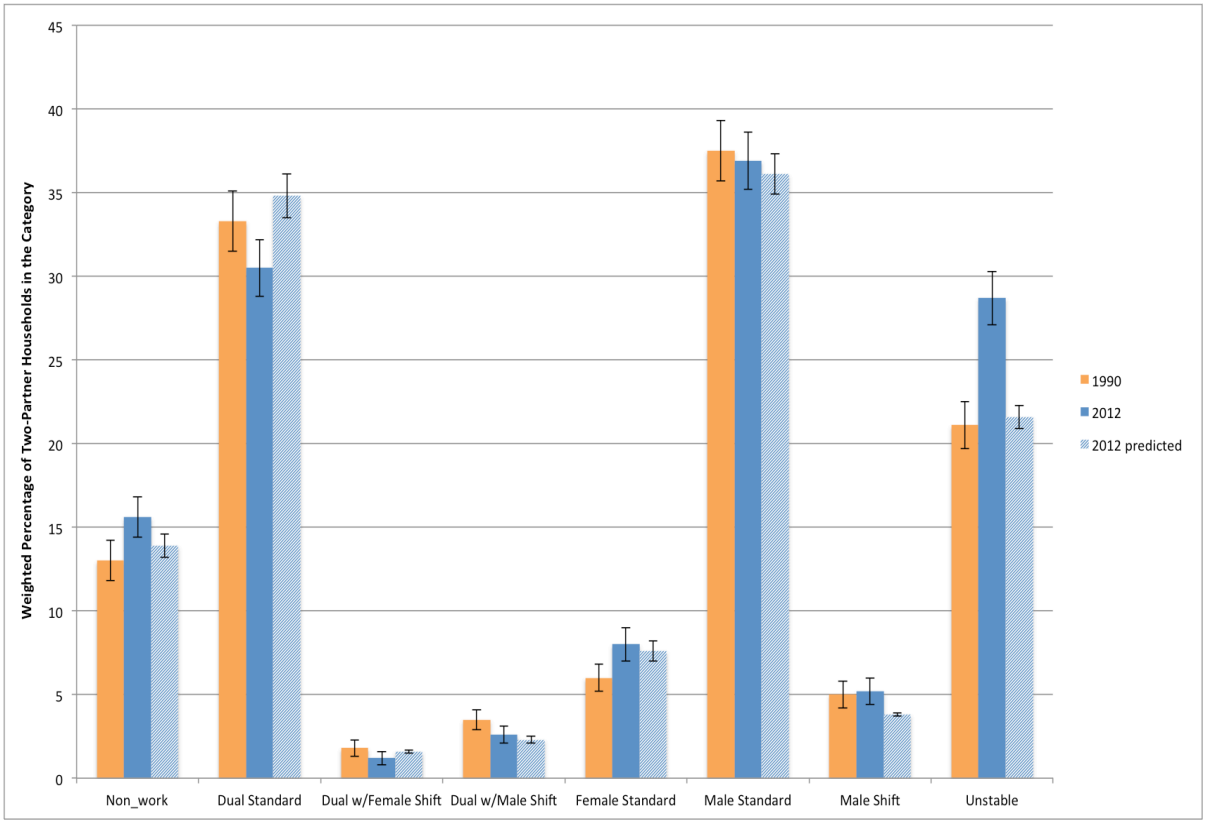


**Figure 4.** Comparison of work schedules in two-partner households, by year.

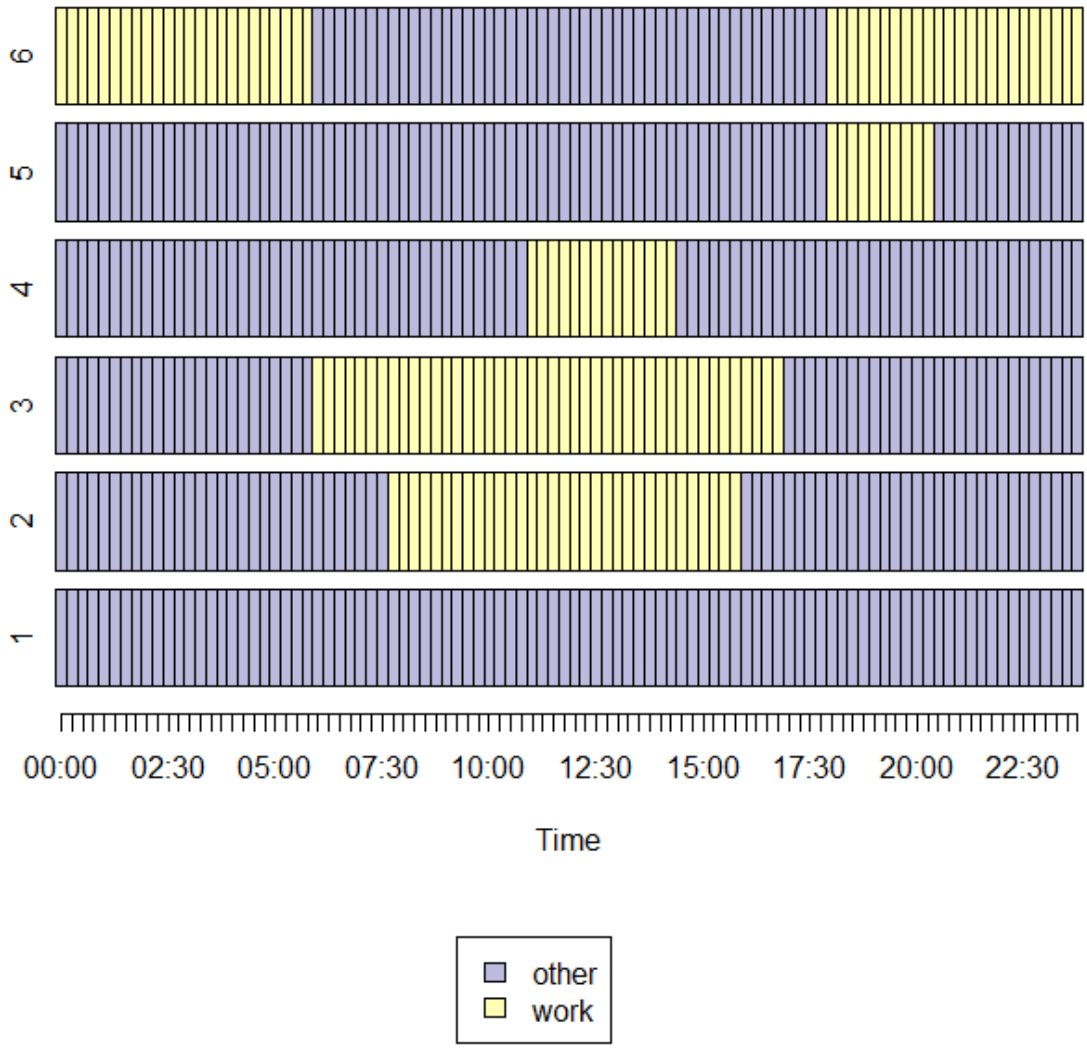


**Figure A1.** Sequence index plot of six selected Tuesdays.

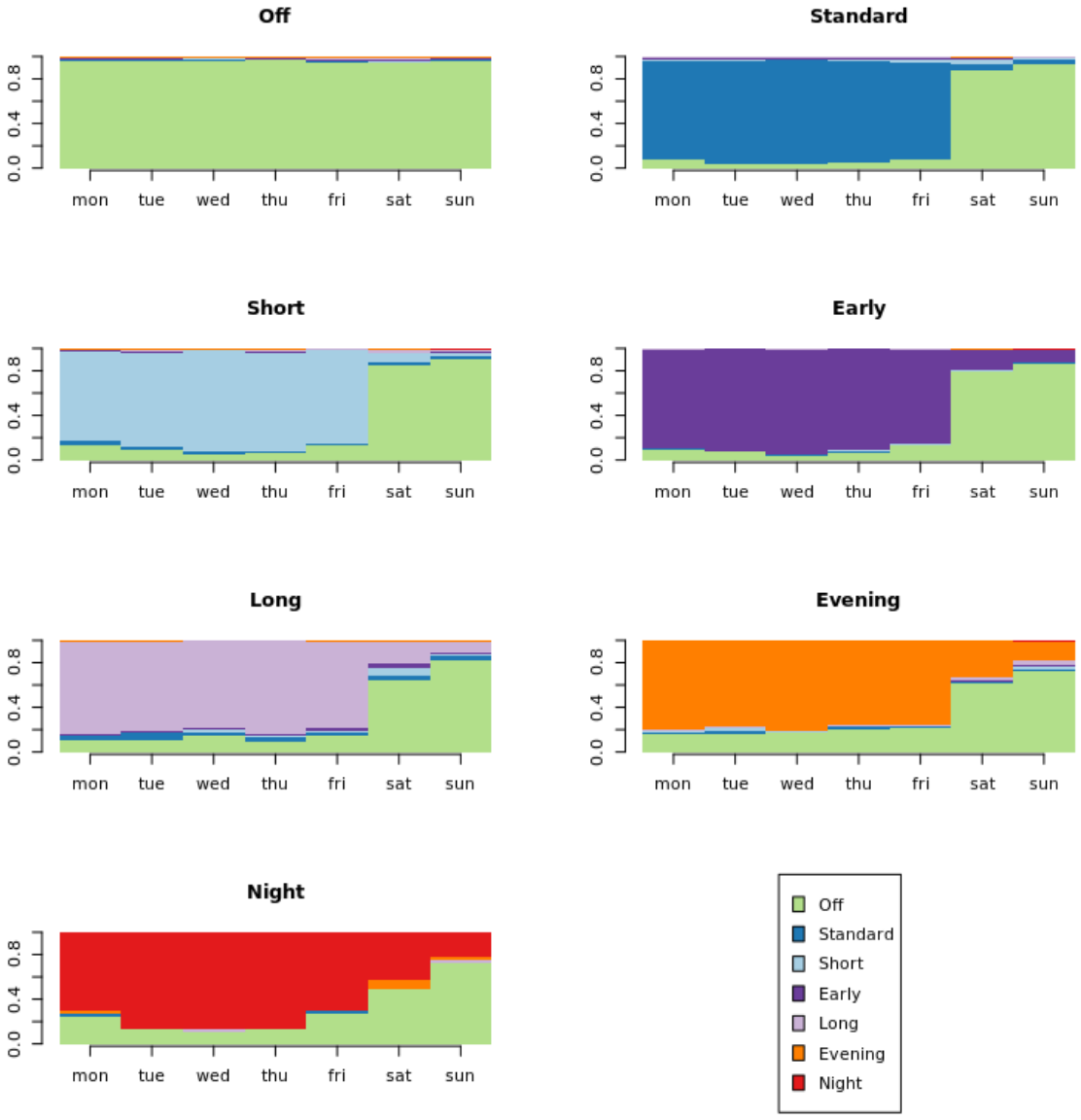


**Figure A2.** Sequence index plot of six selected Tuesdays.

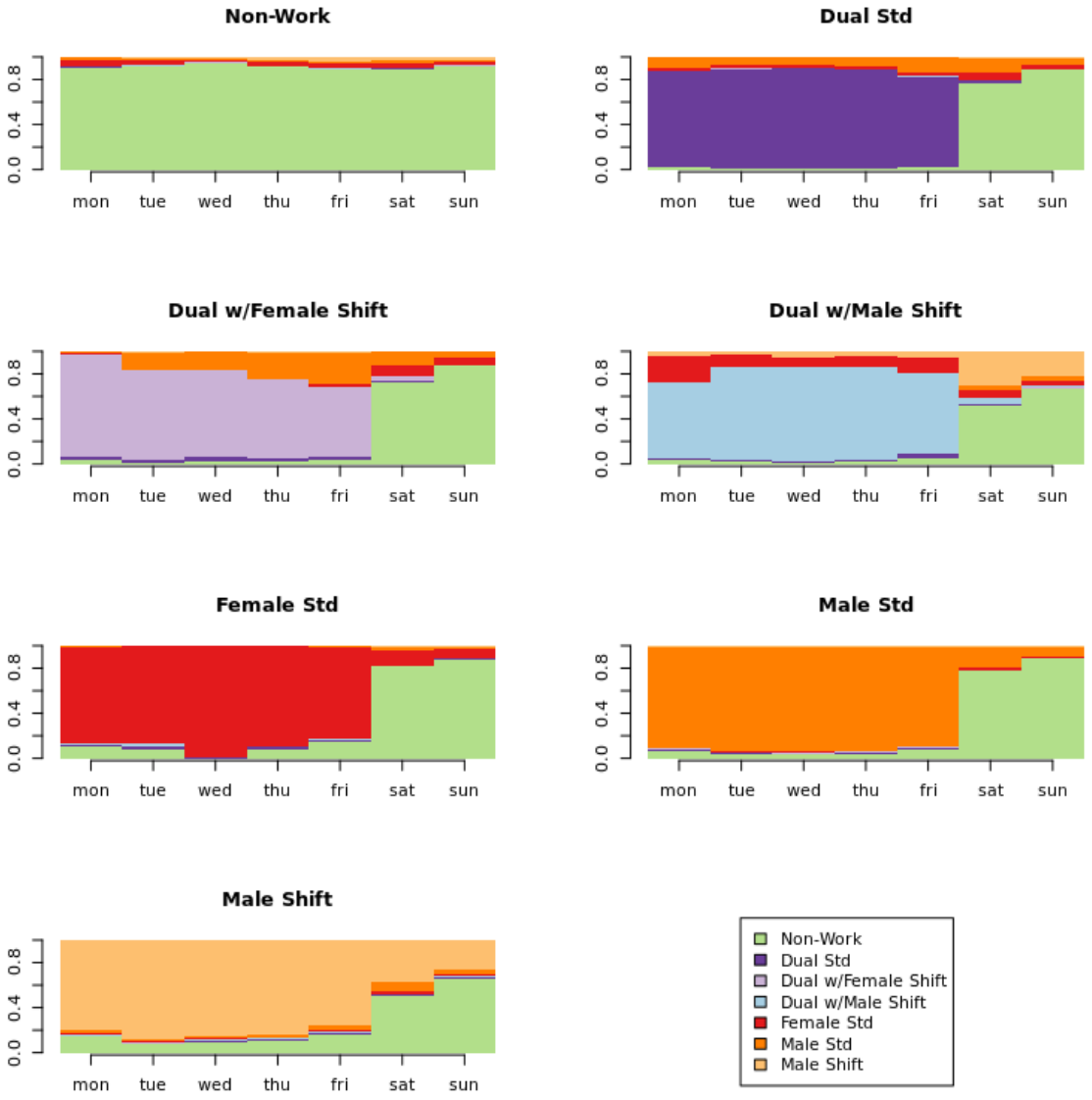


**Figure A3.** Sequence index plot of six selected Tuesdays.

**Table 1. Sample Description**

| | Single-Mother Households | | | | | Two-Partner Households | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NCCS (1990) | | NSECE (2012) | | | NCCS (1990) | | NSECE (2012) | |
| | Mean | SD | Mean | SD | | Mean | SD | Mean | SD |
| Number Kids | 1.66 | 0.86 | 1.74 | 0.96 | Number Kids | 1.8 | 0.84 | 1.84 | 0.91 |
| Age of the Youngest Kid | 5.09 | 3.62 | 5.61 | 3.66 | Age of the Youngest Kid | 4.54 | 3.67 | 5.14 | 3.72 |
| Other Adults in the HH (%) | 18.6 | | 36.1 | | Other Adults in the HH (%) | 7.9 | | 15.2 | |
| Family Income | 24,000 | 23,800 | 27,600 | 28,900 | Family Income | 70,300 | 47,200 | 70,600 | 51,000 |
| Welfare receipt (%) | 40.3 | | 37.7 | | Welfare receipt (%) | 5.8 | | 13.4 | |
| Homeowner (%) | 22.3 | | 22.3 | | Homeowner (%) | 71.3 | | 63.8 | |
| Respondent's Race | | | | | Respondent's Race | | | | |
| White | 50.7 | | 41.3 | | White | 81.4 | | 67.8 | |
| Black | 37.3 | | 29.5 | | Black | 7.9 | | 7.0 | |
| Hispanic | 10.6 | | 23.9 | | Hispanic | 9.6 | | 16.9 | |
| Other | 1.4 | | 5.3 | | Other | 1.1 | | 8.3 | |
| | | | | | | | | | |
| Mother's Age | 30.7 | 7.14 | 33.1 | 8.24 | Mother's Age | 33.1 | 6.37 | 35.7 | 7.61 |
| Mother's Education | | | | | Mother's Education | | | | |
| Less than HS | 21.1 | | 18.1 | | Less than HS | 9.0 | | 9.4 | |
| HS diploma/GED | 46.6 | | 26.8 | | HS diploma/GED | 39.7 | | 19.3 | |
| Some college | 22.3 | | 27.5 | | Some college | 24.7 | | 19 | |
| College + | 10.0 | | 27.6 | | College + | 26.6 | | 52.4 | |
| Mother's Occupation | | | | | Mother's Occupation | | | | |
| None recorded | 49.7 | | 40.0 | | None recorded | 42.8 | | 39.5 | |
| Managerial/Professional | 7.3 | | 16.8 | | Managerial/Professional | 17.1 | | 27.4 | |
| Technicians/Support/Sales | 4.0 | | 5.9 | | Technicians/Support/Sales | 5.9 | | 7.5 | |
| Administrative | 17.8 | | 11.5 | | Administrative | 17.8 | | 9.8 | |
| Service | 13.0 | | 21.8 | | Service | 11.5 | | 12.3 | |
| Production/Manufacturing | 8.2 | | 4.0 | | Production/Manufacturing | 4.8 | | 3.5 | |
| Mother's Hours Working | | | | | Mother's Hours Working | | | | |
| None | 44.1 | | 42.0 | | None | 43.3 | | 42.3 | |
| <35 hours | 13.7 | | 28.0 | | <35 hours | 19.0 | | 27.7 | |
| >=35 hours | 42.2 | | 29.9 | | >=35 hours | 37.7 | | 30.0 | |
| | | | | | | | | | |
| | | | | | Partner's Age | 35.4 | 7.1 | 38.2 | 8.32 |
| | | | | | Partner's Education | | | | |
| | | | | | Less than HS | 9.3 | | 10.5 | |
| | | | | | HS diploma/GED | 38.1 | | 25.1 | |
| | | | | | Some college | 21.4 | | 17.6 | |
| | | | | | College + | 31.2 | | 46.9 | |
| | | | | | Partner's Occupation | | | | |
| | | | | | None recorded | 8.5 | | 12.5 | |
| | | | | | Managerial/Professional | 23.0 | | 33.1 | |
| | | | | | Technicians/Support/Sales | 14.9 | | 16.2 | |
| | | | | | Administrative | 12.0 | | 4.1 | |
| | | | | | Service | 5.5 | | 9.2 | |
| | | | | | Production/Manufacturing | 36.1 | | 24.9 | |
| | | | | | Partner's Hours Working | | | | |
| | | | | | None | 16.8 | | 17.7 | |
| | | | | | <35 hours | 3.3 | | 15.3 | |
| | | | | | >=35 hours | 79.9 | | 67.0 | |
| | | | | | Partner Married to Mother | 96.5 | | 88.8 | |

**Table 2. Work Schedules in Single-Mother Households**

| | Column 1 | | Column 2 | | Column 3 | | Column 4 | | Column 5 | | Column 6 | | Column 7 | | Column 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prevalence (% of person-weeks) | | Avg Weekday Standard Hrs Worked | | Avg Weekday Nonstd Hrs Worked | | Avg Weekend Hrs Worked | | Avg Non-Working Days | | Avg Part-Time Working Days | | Avg Full-Time Working Days | | Within-Week Variability (% of person-weeks) | |
| **Work Schedule** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** | **1990** | **2012** |
| Non-Work | 50.5 | 53.5 | 0.2 | 0.3 | 0.1 | 0.1 | 0.3 | 0.5 | 6.6 | 6.4 | 0.3 | 0.4 | 0.1 | 0.2 | 3.1 | 4.1 |
| Standard | 25.0 | 20.4 | 8.3 | 7.4 | 0.3 | 0.2 | 0.7 | 0.8 | 1.9 | 2.1 | 0.2 | 0.6 | 4.9 | 4.3 | 12.9 | 21.7 |
| Off-Standard Schedules | 20.8 | 20.5 | 6.4 | 5.9 | 1.0 | 0.8 | 1.6 | 1.3 | 1.9 | 2.1 | 1.3 | 1.9 | 3.8 | 3.0 | 13.4 | 21.6 |
| Short | 4.9 | 6.6 | 4.7 | 4.7 | 0.1 | 0.1 | 1.2 | 0.6 | 2.0 | 2.2 | 4.7 | 4.5 | 0.2 | 0.3 | 17.4 | 21.0 |
| Early | 13.4 | 9.4 | 6.8 | 6.2 | 1.2 | 1.1 | 1.7 | 1.1 | 1.8 | 2.1 | 0.3 | 0.6 | 4.9 | 4.2 | 8.6 | 12.9 |
| Long | 2.5 | 4.4 | 7.7 | 7.1 | 1.4 | 1.3 | 2.2 | 2.6 | 1.8 | 1.9 | 0.2 | 0.8 | 5.0 | 4.3 | 31.6 | 41.0 |
| Nonstandard Schedules | 3.6 | 5.6 | 1.7 | 2.1 | 5.6 | 3.7 | 2.4 | 2.8 | 1.8 | 2.0 | 1.2 | 2.4 | 4.0 | 2.7 | 20.5 | 25.6 |
| Evening | 2.5 | 4.7 | 2.0 | 2.4 | 4.5 | 3.4 | 2.0 | 2.6 | 2.1 | 2.1 | 1.3 | 2.2 | 3.7 | 2.7 | 20.8 | ‡ |
| Night | 1.1 | 0.9 | 1.0 | 0.2 | 8.1 | 5.3 | 3.4 | 3.8 | 1.2 | 1.3 | 0.9 | 3.3 | 4.9 | 2.3 | 19.8 | ‡ |

‡ Value suppressed due to small n

Standard hours are defined as 8 am through 6 pm, Monday through Friday. Non-Working days are those in which no work is reported; part-time days are those in which less than seven hours work is reported.

**Table 3. Regression Models Predicting Work Schedule and Within-Week Schedule Variability in Single Mother Households**

| | Model 1: Non-Work | | Model 2: Standard | | Model 3: Off-Std | | Model 4: Nonstd | | Model 5: Within-Week Variability | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig |
| NSECE | 0.741 | | -0.881 | ** | 0.432 | | 0.992 | | 0.739 | |
| Mother's Education | | | | | | | | | | |
| Less than HS | 0.047 | | -0.345 | | 0.381 | | -0.708 | | -0.107 | |
| HS diploma/GED (ref) | | | | | | | | | | |
| Some college | -0.202 | | 0.076 | | 0.039 | | 0.03 | | 0.203 | |
| College + | -0.212 | | 0.235 | | -0.065 | | -0.361 | | 0.381 | |
| Mother's Education*NSECE | | | | | | | | | | |
| Less than HS | -0.185 | | 0.116 | | -0.098 | | 0.65 | | -0.084 | |
| HS diploma/GED (ref) | | | | | | | | | | |
| Some college | 0.305 | | -0.03 | | -0.135 | | -0.084 | | 0.42 | |
| College + | 0.103 | | 0.26 | | 0.021 | | -1.27 | | 0.137 | |
| Mother's Occupation | | | | | | | | | | |
| None recorded | 5.95 | *** | -4.82 | *** | -3.15 | *** | -17.0 | *** | -17.7 | *** |
| Managerial/Professional | 0.515 | | -0.737 | * | 0.499 | | 0.854 | | 0.539 | |
| Technicians/Support/Sales | 0.141 | | 0.006 | | 0.052 | | -17.0 | *** | 0.366 | |
| Administrative (ref) | | | | | | | | | | |
| Service | 1.32 | ** | -1.93 | *** | 0.878 | ** | 1.57 | * | 1.14 | ** |
| Production/Manufacturing | 0.461 | | -1.45 | *** | 0.918 | ** | 1.86 | ** | 0.175 | |
| Mother's Occupation*NSECE | | | | | | | | | | |
| None recorded | 15.3 | *** | -13.5 | *** | -14.8 | *** | -0.621 | | -0.152 | |
| Managerial/Professional | -0.348 | | 0.514 | | -0.528 | | -0.203 | | -0.933 | + |
| Technicians/Support/Sales | 0.15 | | -0.343 | | 0.101 | | 17.1 | *** | -0.703 | |
| Administrative (ref) | | | | | | | | | | |
| Service | -0.352 | | 0.75 | + | -0.933 | * | -0.443 | | -1.09 | * |
| Production/Manufacturing | -0.634 | | 0.674 | | -0.495 | | -0.605 | | -0.67 | |
| Schedule | | | | | | | | | | |
| Non-Work | | | | | | | | | 0.03 | |
| Standard (ref) | | | | | | | | | | |
| Off-Standard | | | | | | | | | -0.408 | |
| Nonstandard | | | | | | | | | -0.587 | |
| Schedule *NSECE | | | | | | | | | | |
| Non-Work | | | | | | | | | -0.421 | |
| Standard (ref) | | | | | | | | | | |
| Off-Standard | | | | | | | | | 0.435 | |
| Nonstandard | | | | | | | | | 0.861 | |
| | | | | | | | | | | |
| N | 3540 | | 3540 | | 3540 | | 3540 | | 3540 | |
| Pseudo R-squared | 0.588 | | 0.329 | | 0.251 | | 0.225 | | 0.224 | |
| AIC | 1880 | | 2360 | | 2460 | | 940 | | 1680 | |

significance levels: +<.1, *<.05, **<.01, ***<.001

**Table 4. Work Schedules in Two-Partner Households**

| | Column 1 | | Column 2 | | Column 3 | | Column 4 | | Column 5 | | Column 6 | | Column 7 | | Column 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prevalence (% of person-weeks) | | Avg Weekday Standard Hrs Worked | | Avg Weekday Nonstd Hrs Worked | | Avg Weekend Hrs Worked | | Avg Non-Working Days | | Avg Part-Time Working Days | | Avg Full-Time Working Days | | Observed Variability (% of person-weeks) | |
| | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 | 1990 | 2012 |
| **Non-Work** | 13.0 | 15.6 | | | | | | | | | | | | | 1.6 | 6.3 |
| Female Partner | | | 0.5 | 0.7 | 0.4 | 0.5 | 0.4 | 0.9 | 6.2 | 5.8 | 0.3 | 0.6 | 0.5 | 0.6 | | |
| Male Partner | | | 0.2 | 0.5 | 0.2 | 0.3 | 0.3 | 0.7 | 6.6 | 6.2 | 0.2 | 0.5 | 0.2 | 0.4 | | |
| **Dual Standard** | 33.3 | 30.5 | | | | | | | | | | | | | 35.3 | 52.9 |
| Female Partner | | | 7.4 | 6.7 | 0.4 | 0.4 | 0.6 | 0.6 | 2.1 | 2.3 | 0.7 | 1.1 | 4.2 | 3.6 | | |
| Male Partner | | | 8.3 | 7.6 | 1.0 | 0.9 | 0.9 | 1.2 | 1.9 | 1.9 | 0.1 | 0.5 | 5.0 | 4.6 | | |
| **Female Standard** | 1.8 | 1.2 | | | | | | | | | | | | | 62.1 | 77.3 |
| Female Partner | | | 1.7 | 1.7 | 3.8 | 3.6 | 1.3 | 2.6 | 2.4 | 2.0 | 2.1 | 2.5 | 2.5 | 2.4 | | |
| Male Partner | | | 8.3 | 7.3 | 0.7 | 0.9 | 0.8 | 0.9 | 1.8 | 1.9 | 0.1 | 0.8 | 5.1 | 4.3 | | |
| **Male Standard** | 3.5 | 2.6 | | | | | | | | | | | | | 56.0 | 81.7 |
| Female Partner | | | 7.1 | 6.5 | 0.6 | 0.5 | 0.9 | 1.0 | 2.0 | 2.2 | 0.9 | 1.0 | 4.1 | 3.8 | | |
| Male Partner | | | 2.0 | 1.8 | 5.8 | 4.6 | 2.1 | 3.7 | 1.6 | 1.9 | 0.7 | 1.8 | 4.8 | 3.4 | | |
| **Dual w/Female Shift** | 6.0 | 8.0 | | | | | | | | | | | | | 11.3 | 14.1 |
| Female Partner | | | 7.4 | 6.8 | 0.6 | 0.6 | 0.9 | 1.1 | 2.0 | 2.1 | 0.5 | 1.1 | 4.5 | 3.9 | | |
| Male Partner | | | 0.3 | 0.4 | 0.2 | 0.2 | 0.4 | 0.5 | 6.5 | 6.3 | 0.3 | 0.4 | 0.2 | 0.2 | | |
| **Dual w/Male Shift** | 37.5 | 36.9 | | | | | | | | | | | | | 11.8 | 16.6 |
| Female Partner | | | 0.4 | 0.5 | 0.3 | 0.2 | 0.3 | 0.4 | 6.2 | 6.2 | 0.6 | 0.6 | 0.2 | 0.2 | | |
| Male Partner | | | 8.5 | 7.7 | 0.9 | 0.9 | 1.3 | 1.3 | 1.8 | 2.0 | 0.1 | 0.4 | 5.1 | 4.6 | | |
| **Male Shift** | 5.0 | 5.2 | | | | | | | | | | | | | 20.8 | 24.3 |
| Female Partner | | | 0.4 | 0.3 | 0.2 | 0.2 | 0.4 | 0.6 | 6.1 | 6.4 | 0.6 | 0.4 | 0.3 | 0.2 | | |
| Male Partner | | | 3.4 | 3.5 | 5.3 | 4.4 | 2.9 | 4.4 | 1.4 | 1.5 | 0.6 | 1.3 | 5.0 | 4.2 | | |

Standard hours are defined as 8 am through 6 pm, Monday through Friday. Non-Working days are those in which no work is reported; part-time days are those in which less than seven hours work is reported.

**Table 5. Regression Models Predicting Work Schedule and Within-Week Variability in Two-Partner Households**

| | Mod 1: Non-Work | | Mod 2: Dual Standard | | Mod 3: Dual w/Female Shift | | Mod 4: Dual w/Male Shift | | Mod 5: Female Std | | Mod 6: Male Std | | Mod 7: Male Shift | | Mod 8: Within-Week Variability | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig | Logit | Sig | | |
| NSECE | -1.01 | | 0.146 | | -1.23 | | 0.957 | | -0.699 | | 0.191 | | -0.531 | | 0.938 | ** |
| Mother's Education | | | | | | | | | | | | | | | | |
| Less than HS | 0.173 | | -0.14 | | -0.652 | | -0.141 | | -0.009 | | 0.143 | | -0.168 | | -0.283 | |
| HS diploma/GED (ref) | | | | | | | | | | | | | | | | |
| Some college | -0.216 | | 0.116 | | -0.261 | | -0.02 | | -0.106 | | 0.154 | | -0.124 | | 0.084 | |
| College + | -0.313 | | 0.184 | | -0.092 | | -0.412 | | -0.158 | | 0.195 | | -0.202 | | -0.036 | |
| Mother's Education * NSECE | | | | | | | | | | | | | | | | |
| Less than HS | -0.268 | | -0.36 | | 0.584 | | 0.073 | | 0.369 | | -0.127 | | 0.466 | | 0.265 | |
| HS diploma/GED (ref) | | | | | | | | | | | | | | | | |
| Some college | 0.407 | | -0.289 | | 0.813 | | -0.182 | | 0.816 | + | -0.498 | * | 0.615 | | 0.155 | |
| College + | 0.435 | | 0.085 | | 0.364 | | -0.054 | | 0.619 | | -0.656 | ** | 0.433 | | 0.095 | |
| Partner's Education | | | | | | | | | | | | | | | | |
| Less than HS | -0.191 | | 0.423 | + | -0.477 | | -0.431 | | -0.05 | | 0.129 | | -0.258 | | -0.221 | |
| HS diploma/GED (ref) | | | | | | | | | | | | | | | | |
| Some college | 0.39 | * | -0.24 | | -0.252 | | 0.082 | | 0.203 | | -0.004 | | -0.119 | | 0.179 | |
| College + | -0.013 | | -0.213 | | 0.131 | | -0.975 | * | 0.294 | | 0.41 | * | -0.813 | * | -0.212 | |
| Partner's Education * NSECE | | | | | | | | | | | | | | | | |
| Less than HS | 0.696 | * | -0.508 | | 0.515 | | -0.465 | | -0.131 | | 0.093 | | -0.717 | | 0.036 | |
| HS diploma/GED (ref) | | | | | | | | | | | | | | | | |
| Some college | -0.427 | | 0.295 | | -1.44 | * | -0.657 | | 0.241 | | 0.057 | | 0.112 | | -0.379 | + |
| College + | -0.189 | | -0.069 | | -0.591 | | 0.444 | | -0.211 | | 0.29 | | 0.219 | | -0.197 | |
| Mother's Occupation | | | | | | | | | | | | | | | | |
| None recorded | 1.91 | *** | -5.48 | *** | -17.4 | *** | -18.1 | *** | -2.6 | *** | 3.15 | *** | 1.58 | *** | -2.21 | *** |
| Managerial/Professional | 0.478 | | -0.032 | | 0.448 | | -0.622 | * | 0.106 | | 0.032 | | -0.105 | | 0.061 | |
| Technicians/Support/Sales | 1.01 | * | -0.494 | ** | 1.1 | * | -0.759 | + | -0.366 | | 0.701 | ** | -0.446 | | 0.636 | *** |
| Administrative (ref) | | | | | | | | | | | | | | | | |
| Service | 1.1 | ** | -0.877 | *** | 1.5 | *** | -0.519 | + | -0.565 | * | 0.995 | *** | 0.656 | | 0.714 | *** |
| Production/Manufacturing | -0.156 | | -0.437 | * | 0.636 | | 0.354 | | 0.382 | | 0.205 | | 0.124 | | -0.134 | |
| Mother's Occupation * NSECE | | | | | | | | | | | | | | | | |
| None recorded | 0.268 | | -14.7 | *** | -0.529 | | 0.671 | * | -15.6 | *** | 0.035 | | 0.64 | | 0.121 | |
| Managerial/Professional | 0.154 | | -0.246 | | -1.25 | | 0.726 | | -0.191 | | 0.194 | | 0.378 | | -0.038 | |
| Technicians/Support/Sales | -0.542 | | 0.23 | | -1.54 | + | 0.611 | | 0.259 | | -0.451 | | 1.17 | | -0.706 | * |
| Administrative (ref) | | | | | | | | | | | | | | | | |
| Service | 0.134 | | -0.126 | | -1.41 | * | 0.497 | | 0.124 | | 0.152 | | -0.253 | | 0.011 | |
| Production/Manufacturing | 0.867 | | -0.354 | | 0.183 | | -0.005 | | -0.094 | | 0.318 | | -0.193 | | -0.046 | |
| Partner's Occupation | | | | | | | | | | | | | | | | |
| None recorded | 3.8 | *** | -19.2 | *** | -17.5 | *** | -16.6 | *** | 3.21 | *** | -5.76 | *** | -2.23 | * | -16.2 | *** |
| Managerial/Professional | 0.521 | | -0.031 | | -0.394 | | -0.206 | | -0.263 | | -0.114 | | 0.164 | | 0.295 | |
| Technicians/Support/Sales | 0.145 | | -0.181 | | -1.14 | + | -0.191 | | 0.419 | | 0.078 | | 0.185 | | 0.107 | |
| Administrative (ref) | | | | | | | | | | | | | | | | |
| Service | 1.17 | ** | -0.708 | * | -0.256 | | 1.62 | *** | 0.237 | | -0.951 | *** | 1.01 | * | 0.369 | |
| Production/Manufacturing | 0.355 | | -0.417 | * | 0.292 | | 0.632 | + | 0.176 | | -0.108 | | 0.419 | | -0.13 | |
| Partner's Occupation * NSECE | | | | | | | | | | | | | | | | |
| None recorded | 0.345 | | -0.341 | | 1.93 | * | -1.17 | * | 0.828 | | -11.9 | *** | -13.3 | *** | -1.33 | ** |
| Managerial/Professional | 0.048 | | -0.121 | | 2.48 | * | -1.7 | * | 0.369 | | 0.398 | | -0.684 | | -0.299 | |
| Technicians/Support/Sales | 0.909 | | -0.182 | | 2.29 | * | -0.998 | | -0.188 | | 0.11 | | -0.026 | | 0.005 | |
| Administrative (ref) | | | | | | | | | | | | | | | | |
| Service | 0.388 | | -0.167 | | 1.16 | | -0.853 | | 0.453 | | 0.078 | | 0.279 | | -0.164 | |
| Production/Manufacturing | 0.696 | | 0.077 | | 1.74 | + | -1.21 | * | 0.149 | | 0.045 | | -0.24 | | 0.148 | |
| Work Schedule | | | | | | | | | | | | | | | | |
| Non-Work | | | | | | | | | | | | | | | -2.27 | *** |
| Dual Standard (ref) | | | | | | | | | | | | | | | | |
| Dual w/Female Shift | | | | | | | | | | | | | | | 1.22 | *** |
| Dual w/Male Shift | | | | | | | | | | | | | | | 0.788 | *** |
| Female Standard | | | | | | | | | | | | | | | -0.604 | * |
| Male Standard | | | | | | | | | | | | | | | -0.154 | |
| Male Shift | | | | | | | | | | | | | | | 0.668 | * |
| Work Schedule*NSECE | | | | | | | | | | | | | | | | |
| Non-Work | | | | | | | | | | | | | | | 1.25 | * |
| Dual Standard (ref) | | | | | | | | | | | | | | | | |
| Dual w/Female Shift | | | | | | | | | | | | | | | -0.01 | |
| Dual w/Male Shift | | | | | | | | | | | | | | | 0.576 | |
| Female Standard | | | | | | | | | | | | | | | -0.052 | |
| Male Standard | | | | | | | | | | | | | | | -0.404 | * |
| Male Shift | | | | | | | | | | | | | | | -0.489 | |
| N | 8390 | | 8390 | | 8390 | | 8390 | | 8390 | | 8390 | | 8390 | | 8390 | |
| Pseudo R-squared | 0.288 | | 0.428 | | 0.174 | | 0.232 | | 0.338 | | 0.339 | | 0.138 | | 0.259 | |
| AIC | 4630 | | 6400 | | 1100 | | 1820 | | 2860 | | 7610 | | 2880 | | 7380 | |

significance levels: +<.1, *<.05, **<.01, ***<.001

**Table A1. Summary of Time Trimmed from Working Schedules by Distance to Work and Urbanicity.**

| | High-Density Urban | Moderate-Density Urban | Rural |
|---|---|---|---|
| **0 Miles** | 0 mins | 0 mins | 0 mins |
| **<3 Miles** | 15 mins | 15 mins | 15 mins |
| **3-8 Miles** | 30 mins | 30 mins | 30 mins |
| **>8 Miles** | 45 mins | 45 mins | 30 mins |

**Table A2. Observed Work Schedule Variability and NCCS/NSECE Scheduling Questions**

| | | Within-Week Schedule Variability | |
|---|---|---|---|
| | | No (%) | Yes (%) |
| **Single Mother Households** | **Varying Schedule (NCCS)** | | |
| | No | 86.1 | 56.8 |
| | Yes | 13.9 | 43.2 |
| | **Usual Schedule (NSECE)** | | |
| | None | 15.7 | 37.2 |
| | Unusual | 10.4 | 12.8 |
| | Usual | 73.9 | 49.9 |
| | **Advance Notice (NSECE)** | | |
| | <1 Week | 26.6 | 42.9 |
| | 1-2 Weeks | 11.7 | 18.1 |
| | 3+ weeks | 61.6 | 39 |
| **Two-Partner Households** | **Varying Schedule (NCCS)** | | |
| | No | 63 | 46.3 |
| | Yes | 37 | 53.7 |
| | **Usual Schedule (NSECE)** | | |
| | None | 20.3 | 30.6 |
| | Unusual | 9.7 | 14.6 |
| | Usual | 69.9 | 54.8 |
| | **Advance Notice (NSECE)** | | |
| | <1 Week | 34.3 | 39.5 |
| | 1-2 Weeks | 10.7 | 14.9 |
| | 3+ weeks | 55.1 | 45.7 |

**Table A3. Observed Work Schedule Variability and Hours Worked in the Recorded Week**

| | | Observed Variability | |
|---|---|---|---|
| | | No | Yes |
| **Single Mother Households** | **Female Working Hours (1990)** | | |
| | None (%) | 100.0 | 0.0 |
| | <35 (%) | 82.6 | 17.4 |
| | >=35 (%) | 85.9 | 14.1 |
| | **Female Working Hours (2012)** | | |
| | None (%) | 100.0 | 0.0 |
| | <35 (%) | 81.4 | 18.6 |
| | >=35 (%) | 75.7 | 24.3 |
| **Two-Partner Households** | **Female Working Hours (1990)** | | |
| | None (%) | 96.9 | 3.1 |
| | <35 (%) | 48.4 | 51.6 |
| | >=35 (%) | 73.4 | 26.6 |
| | **Female Working Hours (2012)** | | |
| | None (%) | 94.1 | 5.9 |
| | <35 (%) | 46.1 | 53.9 |
| | >=35 (%) | 62.5 | 37.5 |
| | **Male Working Hours (1990)** | | |
| | None (%) | 100.0 | 0.0 |
| | <35 (%) | 69.8 | 30.2 |
| | >=35 (%) | 74.8 | 25.2 |
| | **Male Working Hours (2012)** | | |
| | None (%) | 100.0 | 0.0 |
| | <35 (%) | 62.8 | 37.2 |
| | >=35 (%) | 65.7 | 34.3 |