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Do Non-standard Working Hours Cause Negative Health Effects? Some Evidence from Panel Data

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ABSTRACT

What does the around-the-clock economic activity mean for workers' health? Despite the fact that non-standard work accounts for an increasing share of the job opportunities, relatively little is known about the potential consequences for health and the existing evidence is ambiguous. In this paper I examine the relationship between non-standard job schedules and workers' physical and mental health outcomes using longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA). Specifically, the four health indicators considered are self-rated health and the SF-36 health indices for general health, mental health and physical functioning. In terms of direction of the effects, overall results generally suggest a negative relationship between non-standard work schedules and better health for both males and females. Regarding the statistical significance and magnitudes of the effects, however, we observe apparent differences between males and females. Among females, most of the coefficients in all models are statistically insignificant, which implies very small magnitudes in terms of the correlation between non-standard working hours and health. These results apply uniformly to all health measures investigated. Among males, on the other hand, the negative relationship is more noticeable for self-rated health, general health and physical functioning than for mental health. The pooled OLS and random effects coefficients are usually larger in magnitude and more significant than the fixed effects parameters. Nonetheless, even the more significant coefficients, fortunately, do not imply large effects in absolute terms.

Keywords: Non-standard work, physical health, mental health

JEL classifications: J22, J28, J81, I10, I1

1. INTRODUCTION

In many of the developed countries such as the US and UK, most employed individuals have only one full-time paid job, although the relative size of this majority has been rapidly declining as various forms of non-standard work became more common. Part-time work has been increasing since the middle of the twentieth century, but the trend accelerated during the 1980s and 1990s. Own-account self-employment rates have been slowly rising, and temporary or contract work arrangements are also becoming more common. In addition, the proportion of workers holding more than one job has risen since the early 1980s.[1]

The driving factors behind the "24-hour society" (the trend towards longer and non-standard business hours) are diverse and inter-related. In recent years motivated by commercial competitiveness, more businesses have begun to operate outside standard hours, contributing to a culture of long or unusual work hours. By operating around-the-clock or with extended hours, industry can increase productivity. Some sectors (such as manufacturing) have done this for many years. However, globalisation and the advent of technologies like the internet have led more sectors to follow the same suit.[2]

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[1] For reference and more detailed information on the rise of non-standard work arrangements, see, for example, Karoly and Panis (2004), Poissonnet and Veron (2000), Kalleberg (2000) among many others.

[2] For more discussion regarding the causes of non-standard work, see Houseman and Osawa (2003), Kalleberg (2000) and the report published in November 2005 by the U.K. Parliamentary Office of Science and Technology titled as *The 24 Hour Society*.

Consumer demand for out-of-hours services such as shops and restaurants has also been increasing. Our generation typically like stores open evenings and nights, find it easier to make travel reservations or order goods with a live voice on the phone at any time of the day or week, and they expect medical care and other services to be available to them at all times. A survey in 2003 found that 40% of British people say they need to shop outside the hours of 9am to 6pm. This is partly a result of more people working unusual hours and partly because, people are trying to pack more activities into each day.[3]

What does the around-the-clock economic activity mean for workers who provide their labour in the evenings, nights, and weekends? Although the 24/7 economy can increase efficiency and help to meet the consumer demand on the positive side, it can also have serious negative impacts. The pervasiveness of late shifts and weekend employment among individuals calls for an understanding of the added burden of unusual working hours on workers. Non-standard work schedules are a significant, albeit often neglected, social phenomenon, with important implications for health and well-being of workers.

This paper examines whether non-standard working hours cause any negative health effects for both the physical and mental health outcomes using longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA). Although possible damaging repercussions of work schedules (such as working longer hours) on individuals' well-being have been examined previously, one aspect that has not received much empirical attention is the effects of working hour irregularities

[3] For reference, see McOrmond (2004).

(such as night shifts, rotating shifts, split shifts, on call arrangements, or entirely irregular hours) on health outcomes. Examining this issue will have important policy implications for the labour force market and its regulation.

The rest of the paper is organized as follows. Section 2 briefly discusses the related literature. In section 3 I describe the data and provide some useful statistics. Section 4 presents the estimation results and their implications. Finally, I conclude the paper in section 5 with some final remarks.

2. A BRIEF LITERATURE REVIEW

It has long been supposed that there exists a significant relationship between working hours and general well-being of individuals. Much attention has been given to the number of hours that employees work, but the issue of which hours or days has generally gone unnoticed by researchers or policy makers alike.

The empirical literature has primarily focused on employees' physical health and psychological well being including their experience of fatigue or burnout, happiness or distress, cardiovascular disease, as well as workers' work-family imbalance, and quality of relationships with other family members.[4]

A priory, it is assumed that various aspects of work time such as the number of hours worked and the amount of overtime have an impact on general well-being,

[4] For examples, see Dawson et al. (2001) and Surgeon et al. (1997)

work-family balance, and job stress. Despite the frequent endorsement of this proposition, however, little research has *comprehensively* looked at work time as it relates to these outcomes. The results from existing studies paint an ambiguous picture of the role of working hours.[5]

Several studies have supported the view that long hours are detrimental to personal and family well-being (Cooper (2000), Charlesworth et al. (2002), Dawson et al. (2001), Pocock (2003), Glezer and Wolcott (1999)). However, other studies have failed to find an inverse relationship between work hours and the aspects of well-being examined, and some studies have suggested a positive relationship. For instance, Bird and Freemont (1991) and Adellmann et al. (1990) have found a positive relationship between the number of hours worked and health among both males and females. Similarly, Major et al. (2002) have found a positive relationship between work hours and work-family balance. Crohan et al. (1989), Hughes et al. (1992), Menaghan and Parcel (1991), Parcel and Menaghan (1993), Kelley (2001), Gray et al. (2004), on the other hand, have found no direct relationship between the number of hours worked and outcomes such as marital relationship, job satisfaction, happiness, or child well-being.

As suggested by the literature reviews conducted by Barnett (1998) and Major et al. (2002), the mixed finding are hardly surprising given differences in research methodologies adopted, definition of long hours and measures of well-being used. There are also significant differences in the factors that are controlled for in addition

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[5] For detailed reviews, see Barnett (1998), Major et al. (2002), Ganster and Bates (2003).

to working hours. For example, some studies use a sample from one company (e.g. , Hughes et al. (1992), Hughes and Galinsky (1994)), others use only one gender (e.g., Adelmann et al. (1990), Aryee (1992), Barnett and Marshall (1992)), and still others restrict their sample to a single type of job or only white-collar workers (e.g., Greenhaus et. al. (1987), Wallace (1999), Fox and Dwyer (1999)). Restriction of the sample and the range of hours worked could produce attenuation of correlations between working hours and might account for some of the non-significant findings. Many studies also seem to fail in terms of controlling for possibly significant factors that could be confounded with working hours and thus spuriously inflate apparent effects of working hours on health and other well-being measures. Such variables include demographic variables, socio-economic status, occupational differences, life-styles and household structures.

The literature on the effects of non-standard working hours on outcomes such as health and general well-being has been hampered by some of the same data problems as the literature on the impact of long work hours. The researchers have only begun recently to empirically differentiate between long hours and non-standard hours, which would help to stimulate the new data sets to collect detailed information not only on employees' hours of work but also the distribution of hours. Bardasi and Francesconi (2000), Presser (2004), Tausig and Fenwick (2001), Poissonnet and Veron (2000), and Golden (2001), Price and Burgard (2006) are among a few recent examples, which look at the influence of non-standard employment on health and general well-being.

As in the case of long hours, the review of the non-standard working hours literature concludes with more questions then firm answers regarding the effects on

health outcomes and other aspects of general well-being. Carefully documented further analyses are needed to overcome the current limited research, which is generally bound by non-representative samples with restricted ranges of variables, a lack of consistency in measuring work hours and their distribution, and a failure to control for other variables that are confounded with hours of work. Moreover, with a few exceptions such as Bardasi and Francesconi (2000), much of the empirical research has used cross-sectional data to examine the correlation between work hours and well-being. One would imagine that more detailed longitudinal analyses would provide a better understanding of the role of work schedule in determining health and well-being.

3. DATA AND DESCRIPTIVES

The data used in this paper are drawn from the first three waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The data set is a household-based longitudinal study, which began in 2001. It is conducted every year and currently the first three waves of the data are available for use. The survey collects detailed information on economic and demographic well-being, labour market dynamics and family structure. Especially in terms of the interests of the present study, it has detailed information on individuals' working hours and job schedules, and their physical and mental health outcomes. Wave 1 consisted of 7,682 households and 19,914 individuals. Interviews are conducted annually with all members of each household who were at least fifteen years old at the time of the interview. Because the analysis here aims to identify the link between working hour schedules and health outcomes, in terms of sample selection criteria I mainly focus on the group of

employed individuals who were between the ages of 25 and 62 in the first wave of the data. In this way, the sample does not include younger individuals who did not complete their education careers as well as the older retired ones.

Table 1 indicates the employment status distribution of the sample by gender in each wave. Given the sample selection restrictions, the wave 1 includes 2876 males and 2430 females. Among males 91 % are full time employed while the remaining 9 % work part time.[6] The corresponding numbers for females are 53 % and 47 %, respectively.

Because the number of time periods is limited to three, only a small number of individuals exit from employment into either unemployment or not participating in the labour force market anymore. In the second wave of the data, for example, 1% of the previously employed males become unemployed while 3 % leave the labour force market voluntarily to non-employment. The unemployment rate in the third wave remains at the 1% level but the share of those who are non-employed increases to 4 %. The figures for females are slightly different. The unemployment rate among previously employed females is in the range of 1%-2% in the second and third waves of the data. However, the shares of non-participating females in the second and third waves of the data are 8% and 12%, respectively.

Table 2 presents, by gender, the working hour schedule distribution of the employed population in each wave. As mentioned previously, the HILDA asks

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[6] As in most of the surveys, the full time employment here refers to working more than 35 hours per week while part time employment is defined as any positive number of hours below 35.

detailed questions to individuals about their job schedules as well as their hours of work and other job characteristics. Specifically, the HILDA classifies the employed population into seven mutually exclusive groups in terms of their working hour schedules. Those groups are (1) Regular Day, (2) Regular Evening, (3) Regular Night, (4) Rotating Shift, (5) Split Shift, (6) On Call, and finally, (7) Irregular.

Across waves, although there is a great deal of individual level heterogeneity, the overall distribution of job schedules among both males and females shows little changes in terms of the percentages of individuals who fall into each group. Not surprisingly, in the pooled employed male sample the highest number of individuals, 73.8 %, work regular day schedules, usually from Monday to Friday between 9am and 5pm. The second highest share of individuals, 12.2 %, work *totally* irregular hours. Similarly, a reasonably high percentage of employed males, 7.6 %, works in rotating shift schedules. These three groups add up to 93.6 % of the male population, leaving the remaining 6.4 % of the male work force distributed approximately equally into regular evening, regular night, split shift and on call groups.

Although the employment status distributions of males and females in Table 1 indicated significant differences, the working hour schedule distributions of both genders are very similar. Among females, for example, 74.1 % work regular day schedules, 11.3 % fall into the irregular hours group and 6.7 % work in rotating shifts. These percentages are clearly similar to those of males.

Considering that there might be different patterns in the number of working hours with regard to job schedules, in Table 3 I look at the average number of hours worked per week conditional on working hour schedules of the pooled employed population. As one would expect, in terms of hours worked there are apparent

differences between males and females. Unconditional of work schedules, the pooled sample of males work, on average, 45.93 hours per week with a standard deviation of 13.24, while the corresponding mean for females is only 33.10 with a higher standard deviation at 14.85. When I condition working hours on work schedules, a great deal of heterogeneity appears among males and females both in terms of levels and variations. For example, among males, irregular hours group works on average 48.77 hours per week with a standard deviation of 19.32. On the other hand, those males who fall into the regular night group usually work 39.66 hours with a standard deviation of 14.53. The average levels of hours for other groups of males vary within the range of these two groups. Among females, the regular day group works the highest number of hours, which is 34.26, and they have a standard deviation of 13.56. However, the female regular evening group works only 23.37 hours per week and they have a standard deviation of 12.87.

One feature that stands out from these descriptive statistics is that there is a great deal of heterogeneity in hours conditional on job schedules and it might be crucial for researchers to consider not only the number of hours but also their distribution simultaneously to fully understand the link between labour market experience and health outcomes.

Now I turn my attention to the relationship between health outcomes and working hour schedules. Table 4 presents the descriptive measures of health status of the employed individuals conditional on their job schedules. Four main health indicators are considered in this table. Self-rated health is a commonly used subjective health measure, which ranges from 1 to 5, where 1 represents highest level (Excellent) while 5 corresponds to the lowest (Poor). The other three measures of health are

derived index variables ranging between 0-100 and also used commonly in the literature as the SF-36 health indicators for general health, mental health and physical functioning.[7]

Except for a few cases (such as mental health statistics for females), the raw statistics in Table 4 generally suggest that individuals who work regular daytime schedules have relatively better levels of health compared to other individuals who work non-standard hours. Remembering that these statistics do not control for other possibly confounding factors, identifying the significance and the magnitude of this relationship, however, remains to be the task of the multivariate analysis in the next section.

Table 4 also shows that, among both males and females, non-standard work schedules (all other job schedules but regular day group) within themselves show some degree of heterogeneity in terms of their health levels. This implies that the effect of working a regular night schedule, for example, might be significantly different than the effect of working in a rotating shift. To give an example; among employed males while the split shift workers have an average score of 78.83 for mental health, the same score for regular evening workers is only 72.24 points.

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[7]The SF-36 is a multi-purpose, short-form health survey with only 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically-based physical and mental health summary measures and a preference-based health utility index. It is a generic measure, as opposed to one that targets a specific age, disease, or treatment group. Accordingly, the SF-36 has proven useful in surveys of general and specific populations, comparing the relative burden of diseases, and in differentiating the health benefits produced by a wide range of different treatments. A complete set of information about the history and development of the SF-36, its psychometric evaluation, studies of reliability and validity, and normative data is available in the first of three SF-36 user's manuals (Ware, Snow, Kosinski, & Gandek, 1993).

One might think that the effects of working hour schedules on health outcomes might work indirectly through their influence on life style choices as well as through direct mechanisms such as job stress and hazardous working conditions specific to different job schedules. Thus, before concluding the descriptive analysis, in Table 5 I look at the raw statistics of life style choices of the employed individuals conditional, again, on their work schedules. The main variables of the life style choices considered are physical exercise, smoking and drinking. Fortunately the HILDA provides detailed information on these variables both in terms of the propensity and the intensity in each wave. The statistics also suggest that there is some degree of variation in life style choices with respect to job schedules of individuals. As mentioned before, the multivariate analysis in the next section aims to improve our understanding of the relationship between health outcomes and employment schedules, and shed more light on the role of life style choices as they relate to working hour irregularities and health.

4. ESTIMATION RESULTS

For each of the four health indicators considered, I estimate the standard pooled OLS (clustered by individual identity), fixed effects and random effects models using the panel data described in the previous section.[8] Each model is estimated separately

[8] As a robustness check regarding the results presented for the self-rated health status, I also estimated pooled data logit, pooled data ordered logit and ordered fixed effects logit models treating the qualitative responses as ordinal measures. The results are essentially the same as those obtained by treating self rated health responses as continuous cardinal measures. This is consistent with the findings of other studies. In their survey of the empirical literature on life satisfaction using subjective happiness

for males and females. The set of independent variables included in the regressions is the same in each estimation and they are classified into four categories. The first group of variables comprises the economic and demographic variables such as household income, education, age and marital status. The second category contains the job schedule variables. The omitted reference working hour schedule variable is the regular day dummy. Because a few individuals exit the labour force to either unemployment or non-employment in the second and third waves of the data, I also include two dummy variables indicating whether the individual changes employment status within the sample period. Third group of independent variables includes occupation controls and some additional variables, which proxy for some other job characteristics. Finally, the last category controls for the life style variables; exercise, smoking and drinking.[9]

The results are presented in Tables 6-9. In each case, instead of including all independent variables at once, I first estimate the model by including the variables in categories one and two only, and then gradually add categories three and four.[10] The results corresponding to each estimation are shown in columns (1), (2), and (3), respectively. My goal in proceeding the regressions in this way is to see if the effects

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scales, Ferrer-i-Carbonell and Frijters (2004) find that assuming cardinality or ordinality of happiness responses makes little difference to the estimates of determinants of life satisfaction.

[9] The full list of independent variables is provided in the Appendix at the end.

[10] Not to confound the effects of long hours with the impact of non-standard job schedules on health, the number of weekly working hours is included in the first category of independent variables as a continuous variable in every regression. Instead of controlling for working hours continuously, inclusion of a few discreet bracketed hours dummy variables gives us very similar results for the coefficients on job schedule variables.

of job schedules observed in the initial estimation, if any, are mitigated or exacerbated through the inclusion of occupational variables and also to distinguish if some of those effects work indirectly through the life style variables.

Table 6 indicates the results for self-rated health. When focusing on the pooled OLS results for males, we generally observe a negative relationship between non-standard work schedules and better health. Relative to regular day schedules, regular evening shifts, regular night shifts and rotating shifts imply worse self-reported health and the magnitudes of the effects are statistically significant.[11] The negative effects of on call and irregular hours also seem to be important, but they are statistically less significant.

Interestingly, the column (2) shows that the addition of occupational variables to the first stage variables in column (1), does not change the main results regarding the effects of job schedules on health, although most of the added occupational variables turn out to be statistically significant.[12] Thus, the effects of non-standard working hours exist even after controlling for occupational variables and other job characteristics.

The results of column (3) estimation suggest that there is a strictly monotonic

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[11] Remember that the self-rated health ranges from 1 to 5, where 1 represents highest level (Excellent) while 5 corresponds to the lowest (Poor). Therefore, a positive coefficient means a lower level of self-reported health.

[12] Given the large number of independent variables, in Tables 6-9 I only report the estimation results for the job schedule variables. The overriding concern in doing this is to keep the paper focused and save some space in terms of the length of the paper. However, the full set of results regarding the other independent variables is available upon request.

positive relationship between the level of exercise and health, but a reverse link between health and smoking in terms of both propensity and intensity. However, alcohol consumption does not seem to be explaining much variation in self-rated health. These results are generally consistent with the previous literature. Although, some effects of job schedules on health seem to work indirectly through life style variables (mainly through smoking and exercise), most of the effects remain direct after controlling for these variables. Indeed, the coefficient on irregular schedules becomes even more significant in column (3) relative to columns (1) and (2).

The random effects results for males' self-rated health status are very similar to the pooled data OLS results in terms of statistical significance and direction, however the magnitudes of the effects are relatively smaller. As in the case of pooled OLS, the addition of occupational variables does not change the estimated coefficients on job schedules variables in column (2), and column (3) suggests that most of the effects work directly rather than indirectly through the life style variables.

In case of the fixed effects estimation, the coefficients on job schedule variables have generally the same signs as the pooled OLS or random effects cases, however most of the coefficients seem to be statistically insignificant except the coefficient of on call schedules.

The influence of non-standard work hours on females' self-rated health status turns out to be slightly different than the results presented for men. Although, most of the estimated parameters, again, suggest a negative relationship between non-standard work schedules and better health, this correlation is statistically insignificant for almost all types of non-standard job schedules. The only noticeable significant

coefficients are those of irregular schedules in fixed effects and random effects estimations.

Table 7 presents the estimation results for the SF36-general health measure. It is clearly seen from these results that the estimated coefficients on all job schedule variables (relative to regular day schedules) are uniformly negative for males implying lower general health index for those who work non-standard hours.[13] These results are consistent with those previously discussed for self-rated health status of males. Table 7 also shows that statistical significance levels differ between the coefficients for different work schedules such as regular evening shifts and rotating shifts. This suggests that the magnitudes of the detrimental effects of non-standard hours on general health differ by different job schedules. Irregularity of working hours seems to be the most significant factor with much higher t-statistics relative to the other job schedule variables.

The estimated results for females, on the other hand, provide less clear conclusions regarding the effects of non-standard working hours on the SF-36 general health measure. Although, as in the case of self-rated health, the estimated parameters suggest a general negative relationship between job schedules and general health, the coefficients are not uniformly negative and they are mainly statistically insignificant except for a few cases such as on call schedule pooled OLS and irregular hours random effects parameters.

In terms of gradual addition of occupational variables and life style choices, the

[13] Remember here that SF36 health measures used range from 0-100 and a higher score indicates a better health status in terms of the measure used.

results also resemble what is observed in Table 6 for the self-rated health status. That is, the column (2) results in Table 7 show that the addition of occupational variables to the first stage variables in column (1), leaves the coefficients mainly unchanged regarding the effects of job schedules on general health. Moreover, some effects of job schedules on general health work indirectly through smoking and exercise, but most of the effects remain direct after controlling for these variables.

In Table 8 I designate the estimation results for the SF-36 mental health index. Although most of the coefficients suggest that mental health is negatively related to non-standard work schedules among males, their statistical insignificance shows that the implied magnitude of the negative influence is very small. In all estimations, the most significant negative coefficients are observed for regular evening shifts and regular night shifts. Interestingly, the coefficients on split shifts are uniformly positive, though statistically insignificant. As before, the addition of occupation variables to the regressions changes the estimated coefficients only a little. The results for the addition of life style variables to the initial regressions give us similar conclusions to those presented for self-rated health status and the SF-36 general health measure.

Surprisingly, the results for females, on the other hand, support a reverse relationship between mental health and non-standard job schedules. Except for some cases such as fixed effects and random effects on call and irregular schedule coefficients, most of the estimated parameters turn out to be positive. However, most of the coefficients are again statistically insignificant, which implies very small magnitudes in terms of the correlation between non-standard working hours and the mental health index. The most evident positive relationships appear for rotating shifts

and split shits in fixed effects and random effects estimations, and regular night shifts in the pooled OLS estimation.

The final set of results is presented for the SF-36 physical functioning in Table 9. Regarding the impact of non-standard working hours on physical functioning of males, we observe very similar conclusions to those presented for the self-rated and general health of males in Tables 6 and 7. The estimated parameters are almost uniformly negative and generally suggest the existence of a negative relationship between non-standard job schedules and physical functioning, although the statistical significance of the effects varies between different job schedules. With respect to magnitudes, regular evening shifts and regular night shifts seem to have the highest level of influence on physical functioning of males. In each estimation, columns (2) and (3) results are only marginally different than those of column (1). This, again, implies that only a small percentage of the effects of non-standard job schedules observed in column (1), works through either other occupational variables or life style choices.

Female physical functioning estimations are less conclusive. While in the fixed effects case most coefficients of job schedules are positive and insignificant, they are mostly negative in the pooled OLS and random effects cases. Except for pooled OLS regular evening shifts and on call coefficients, the female pooled OLS and random effects job schedules parameters are generally smaller than male coefficients in terms of magnitudes and they are by and large statistically insignificant.

5. CONCLUSIONS

In the past several decades due to mostly increased global competition and pressures for economic efficiency, non-standard work arrangements have become more common in the developed countries and the prospects are that the number of these kinds of jobs will continue to grow. Although the 24/7 economy can increase efficiency and help to meet the consumer demand on the beneficial side, it can also have a serious negative influence on workers who provide their labour in the evenings, nights and weekends.

What does the around-the-clock economic activity mean for workers' health? Despite the fact that non-standard work accounts for an increasing share of the job opportunities, relatively little is known about the potential consequences for health and the existing evidence is ambiguous. In this paper I examine the relationship between non-standard job schedules and workers' physical and mental health outcomes using longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA). Specifically, the four health indicators considered are self-rated health and the SF-36 health indices for general health, mental health and physical functioning.

In terms of direction of the effects, overall results generally suggest a negative relationship between non-standard work schedules and better health for both males and females. This is independent of whether the model used is pooled OLS, fixed effects or random effects. The exception is the females' mental health case where the estimated coefficients support an opposite link between psychological well-being and non-standard job schedules.

Regarding the statistical significance and magnitudes of the effects, however, we observe apparent differences between males and females. Among females, most of the coefficients in all models are statistically insignificant, which implies very small magnitudes in terms of the correlation between non-standard working hours and health. These results apply uniformly to all health measures investigated.

Among males, on the other hand, the negative relationship is more noticeable for self-rated health, general health and physical functioning than for mental health. The pooled OLS and random effects coefficients are usually larger in magnitude and more significant than the fixed effects parameters. Nonetheless, even the more significant coefficients, fortunately, do not imply large effects in absolute terms.

In terms of occupational variables and life style choices, the results show that the addition of occupational variables to the first stage variables in columns (1), leaves the coefficients mainly unchanged regarding the effects of job schedules on health in each case. Moreover, some effects of job schedules on health work indirectly through smoking and exercise, but most of the effects, though small in magnitude, remain direct after controlling for these variables.

Although my preliminary analysis here generally supports good news for the Australian labour market with respect to the effects of non-standard work on health, we have much more to learn and need studies specifically designed to assess the challenges of working in a 24-hour society, in terms of not only health but also other dimensions of general well-being, as more detailed data become available for longer periods.

Job growth projections suggest that non-standard schedules will be on the rise in the decade ahead. The types of occupations that generate this growth are in the service sector and are mostly low paying. For example, we need more public discourse on the role of employers and the government in helping workers on late shifts. How can we enhance the options or at least ease the constraints for those late and rotating shift workers who would prefer standard daytime schedules, and for parents who cannot afford child care costs and have to rely on split-shift parenting between spouses or relatives while preferring not to do so? These issues clearly merit more rigorous special attention in future research.

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Table 1: Employment Status Distribution of Males and Females by Waves

A. MALES

	N	Full Time	Part Time	Unemployed	Not in Labour Force
WAVE 1	2876	0.91	0.09	N/A	N/A
WAVE 2	2563	0.88	0.08	0.01	0.03
WAVE 3	2363	0.86	0.08	0.01	0.04

B. FEMALES

	N	Full Time	Part Time	Unemployed	Not in Labour Force
WAVE 1	2430	0.53	0.47	N/A	N/A
WAVE 2	2199	0.49	0.41	0.02	0.08
WAVE 3	2011	0.49	0.38	0.01	0.12

Table 2: Working Hours Schedule Distribution of the Employed Population

A. MALES

	N	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
WAVE 1	2876	0.728	0.018	0.013	0.079	0.009	0.026	0.129
WAVE 2	2460	0.743	0.018	0.012	0.078	0.010	0.027	0.113
WAVE 3	2238	0.744	0.017	0.012	0.078	0.010	0.027	0.113
Pooled Sample	**7574**	**0.738**	**0.018**	**0.013**	**0.076**	**0.010**	**0.024**	**0.122**

B. FEMALES

	N	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
WAVE 1	2430	0.712	0.027	0.016	0.074	0.012	0.030	0.128
WAVE 2	1982	0.758	0.020	0.016	0.062	0.014	0.022	0.109
WAVE 3	1749	0.763	0.020	0.017	0.062	0.011	0.027	0.098
Pooled Sample	**6161**	**0.741**	**0.023**	**0.016**	**0.067**	**0.012**	**0.027**	**0.113**

Table 3: Number of Hours Conditional on Work Schedule (Pooled Employed Population)

	Total	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
MALES	**45.934**	45.80	40.55	39.66	44.85	45.08	46.88	48.77
	(13.24)	(11.47)	(13.93)	(14.53)	(10.13)	(12.88)	(25.11)	(19.32)
FEMALES	**33.10**	34.26	23.37	32.04	34.04	30.29	27.32	28.77
	(14.85)	(13.56)	(12.87)	(13.48)	(12.06)	(16.21)	(21.49)	(20.16)

Note: Standard deviations are in parentheses.

Table 4: Health Outcomes Conditional on Work Schedule (Pooled Employed Population)

A. MALES

	Total	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
SELF-RATED HEALTH (1-5)								
Excellent	**0.13**	0.14	0.08	0.10	0.11	0.11	0.11	0.13
Very Good	**0.41**	0.42	0.34	0.32	0.38	0.49	0.36	0.39
Good	**0.36**	0.35	0.47	0.41	0.39	0.28	0.41	0.36
Fair	**0.09**	0.08	0.10	0.14	0.10	0.13	0.11	0.12
Poor	**0.01**	0.01	0.02	0.02	0.01	0.00	0.01	0.01
PHYSICAL FUNCTIONING (0-100)	**90.04**	90.54	86.29	84.13	89.53	88.06	88.77	88.91
	(16.38)	(15.82)	(18.16)	(24.40)	(18.21)	(18.74)	(16.70)	(16.71)
GENERAL HEALTH (0-100)	**72.52**	73.09	69.60	69.88	71.84	71.24	71.24	70.55
	(17.93)	(17.74)	(17.46)	(16.49)	(18.49)	(20.17)	(17.08)	(18.73)
MENTAL HEALTH (0-100)	**76.60**	76.75	72.24	73.40	76.65	78.83	76.00	76.58
	(15.11)	(14.90)	(18.51)	(15.95)	(15.52)	(12.71)	(16.44)	(15.26)

B. FEMALES

	Total	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
SELF-RATED HEALTH (1-5)								
Excellent	**0.16**	0.17	0.21	0.12	0.14	0.13	0.13	0.14
Very Good	**0.43**	0.44	0.31	0.40	0.41	0.38	0.38	0.43
Good	**0.33**	0.32	0.31	0.42	0.38	0.38	0.38	0.33
Fair	**0.08**	0.07	0.16	0.07	0.06	0.11	0.10	0.08
Poor	**0.01**	0.01	0.01	0.00	0.01	0.00	0.01	0.01
PHYSICAL FUNCTIONING (0-100)	**88.59**	89.05	84.20	86.77	88.94	87.49	84.45	87.61
	(16.62)	(16.31)	(22.77)	(19.07)	(16.42)	(14.33)	(18.03)	(16.59)
GENERAL HEALTH (0-100)	**74.45**	74.87	72.44	73.00	74.11	72.42	70.49	73.67
	(18.29)	(18.06)	(21.00)	(18.44)	(18.07)	(16.98)	(20.53)	(18.78)
MENTAL HEALTH (0-100)	**74.84**	74.77	73.79	77.10	74.42	75.45	74.70	75.40
	(16.23)	(16.22)	(16.73)	(16.20)	(15.40)	(16.32)	(18.17)	(16.21)

Note: Standard deviations are in parentheses.

Table 5: Life-Style Choices Conditional on Work Schedule (Pooled Employed Population)

A. MALES

	Total	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
PHYSICAL EXCERSIZE								
Not at all	**0.07**	0.07	0.14	0.08	0.08	0.17	0.06	0.06
Less than once a week	**0.16**	0.16	0.15	0.22	0.16	0.08	0.15	0.14
1 to 2 times a week	**0.24**	0.25	0.22	0.23	0.23	0.29	0.27	0.22
3 times a week	**0.15**	0.15	0.13	0.11	0.15	0.11	0.12	0.15
More than 3 times a week but not everyday	**0.23**	0.22	0.19	0.18	0.28	0.17	0.25	0.25
Every day	**0.15**	0.15	0.18	0.19	0.11	0.18	0.16	0.19
SMOKING								
Propensity	**0.26**	0.24	0.46	0.52	0.33	0.43	0.29	0.22
Intensity (Conditional on Smoking)	**96.20**	91.40	104.87	94.54	108.39	86.06	114.98	110.34
	(61.42)	(58.61)	(69.25)	(60.04)	(64.03)	(58.00)	(80.12)	(65.46)
DRINKING								
Propensity	**0.92**	0.93	0.79	0.85	0.95	0.89	0.93	0.90
Intensity (Conditional on Drinking)	**9.32**	9.17	10.02	11.35	9.86	9.40	9.32	9.52
	(10.62)	(10.61)	(9.72)	(13.54)	(10.14)	(11.86)	(10.55)	(10.72)

B. FEMALES

	Total	Regular Day	Regular Evening	Regular Night	Rotating Shift	Split Shift	On Call	Irregular
PHYSICAL EXCERSIZE								
Not at all	**0.09**	0.09	0.16	0.13	0.10	0.09	0.10	0.08
Less than once a week	**0.19**	0.19	0.20	0.22	0.22	0.13	0.16	0.17
1 to 2 times a week	**0.26**	0.26	0.22	0.27	0.25	0.26	0.27	0.27
3 times a week	**0.16**	0.16	0.13	0.13	0.16	0.16	0.15	0.16
More than 3 times a week but not everyday	**0.21**	0.21	0.16	0.19	0.20	0.29	0.19	0.21
Every day	**0.09**	0.09	0.13	0.07	0.08	0.07	0.13	0.11
SMOKING								
Propensity	**0.21**	0.20	0.24	0.29	0.31	0.26	0.22	0.21
Intensity (Conditional on Smoking)	**81.32**	77.01	86.38	93.10	99.88	101.85	91.05	82.80
	(56.95)	(54.44)	(67.53)	(69.95)	(60.22)	(53.73)	(74.83)	(55.51)
DRINKING								
Propensity	**0.88**	0.89	0.84	0.70	0.88	0.80	0.90	0.89
Intensity (Conditional on Drinking)	**6.36**	6.47	5.62	5.28	6.70	7.04	5.91	5.81
	(7.24)	(7.38)	(5.85)	(5.40)	(7.09)	(9.91)	(6.64)	(6.74)

Note: Standard deviations are in parentheses.

Table 6: Estimation Results for Self-Rated Health Status

	Pooled OLS						Fixed Effects						Random Effects					
	(1)		(2)		(3)		(1)		(2)		(3)		(1)		(2)		(3)	
Independent Variables	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
A. MALES																		
Regular Evening Shift	0.205	2.33	0.180	2.04	0.115	1.27	0.120	1.55	0.128	1.65	0.127	1.66	0.159	2.37	0.151	2.26	0.133	2.01
Regular Night Shift	0.220	1.90	0.193	1.70	0.121	1.11	0.015	0.17	0.026	0.30	0.024	0.28	0.087	1.13	0.081	1.06	0.052	0.70
Rotating Shift	0.115	2.40	0.082	1.69	0.058	1.29	0.007	0.15	0.004	0.09	-0.003	-0.05	0.057	1.51	0.043	1.14	0.035	0.95
Split Shift	-0.001	-0.01	-0.007	-0.07	-0.063	-0.53	-0.015	-0.16	-0.012	-0.13	-0.009	-0.10	-0.004	-0.05	-0.007	-0.09	-0.024	-0.29
On Call	0.114	1.59	0.130	1.82	0.110	1.57	0.140	2.39	0.140	2.38	0.135	2.32	0.125	2.39	0.133	2.53	0.119	2.29
Irregular Schedule	0.054	1.48	0.081	2.22	0.090	2.64	0.025	0.85	0.029	1.00	0.021	0.73	0.030	1.15	0.041	1.57	0.042	1.63
B. FEMALES																		
Regular Evening Shift	0.100	0.94	0.079	0.73	0.055	0.55	-0.015	-0.20	-0.008	-0.10	-0.014	-0.18	0.042	0.65	0.042	0.64	0.037	0.56
Regular Night Shift	0.082	0.89	0.064	0.70	-0.016	-0.19	-0.022	-0.21	-0.011	-0.10	-0.026	-0.24	0.036	0.42	0.031	0.36	-0.003	-0.04
Rotating Shift	0.088	1.61	0.084	1.55	0.032	0.61	0.007	0.15	0.005	0.10	0.003	0.06	0.031	0.73	0.027	0.64	0.018	0.44
Split Shift	0.085	0.72	0.046	0.39	0.032	0.30	0.159	1.71	0.164	1.75	0.148	1.59	0.142	1.68	0.136	1.62	0.112	1.34
On Call	0.128	1.66	0.124	1.61	0.113	1.51	-0.023	-0.37	-0.014	-0.23	-0.009	-0.15	0.022	0.40	0.026	0.45	0.035	0.61
Irregular Schedule	0.047	1.09	0.054	1.18	0.045	0.99	0.067	1.92	0.072	1.99	0.074	2.07	0.058	1.88	0.064	2.00	0.069	2.17

Table 7: Estimation Results for SF36 General Health

	Pooled OLS						Fixed Effects						Random Effects					
	(1)		(2)		(3)		(1)		(2)		(3)		(1)		(2)		(3)	
Independent Variables	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
A. MALES																		
Regular Evening Shift	-3.265	-1.81	-2.868	-1.56	-1.302	-0.69	-2.347	-1.60	-2.481	-1.69	-2.430	-1.67	-2.689	-2.05	-2.692	-2.05	-2.273	-1.76
Regular Night Shift	-2.933	-1.35	-2.562	-1.18	-1.003	-0.50	-1.279	-0.76	-1.536	-0.91	-1.353	-0.81	-1.818	-1.22	-1.822	-1.22	-1.183	-0.80
Rotating Shift	-1.524	-1.42	-1.073	-0.99	-0.639	-0.63	-1.363	-1.50	-1.297	-1.43	-1.169	-1.30	-1.404	-1.87	-1.183	-1.57	-1.017	-1.38
Split Shift	-1.967	-0.76	-2.019	-0.79	-0.740	-0.29	-0.881	-0.50	-0.936	-0.53	-0.859	-0.49	-1.113	-0.69	-1.143	-0.70	-0.789	-0.49
On Call	-1.603	-1.14	-1.819	-1.29	-1.443	-1.04	-0.749	-0.67	-0.851	-0.76	-0.727	-0.66	-0.931	-0.91	-1.072	-1.05	-0.810	-0.80
Irregular Schedule	-2.196	-2.78	-2.696	-3.37	-2.857	-3.84	-1.362	-2.45	-1.490	-2.66	-1.312	-2.37	-1.534	-3.05	-1.731	-3.39	-1.676	-3.32
B. FEMALES																		
Regular Evening Shift	-2.279	-1.02	-2.085	-0.93	-1.414	-0.67	1.633	1.14	1.299	0.90	1.479	1.03	0.313	0.25	0.035	0.03	0.255	0.20
Regular Night Shift	-1.306	-0.54	-0.979	-0.41	0.528	0.23	-0.275	-0.14	-0.614	-0.31	-0.579	-0.29	-0.759	-0.45	-0.961	-0.57	-0.530	-0.32
Rotating Shift	-0.792	-0.66	-0.679	-0.56	0.490	0.43	0.578	0.60	0.544	0.56	0.538	0.56	0.079	0.09	0.058	0.07	0.288	0.35
Split Shift	-1.767	-0.83	-1.341	-0.62	-1.322	-0.67	-1.581	-0.90	-1.631	-0.92	-1.680	-0.95	-1.727	-1.06	-1.781	-1.09	-1.669	-1.03
On Call	-3.792	-2.08	-3.942	-2.16	-3.699	-2.07	-0.022	-0.02	-0.200	-0.17	-0.224	-0.19	-0.892	-0.82	-1.051	-0.96	-1.179	-1.08
Irregular Schedule	-0.958	-1.05	-1.454	-1.50	-1.217	-1.28	-0.998	-1.51	-0.918	-1.35	-0.937	-1.38	-1.006	-1.69	-1.100	-1.77	-1.097	-1.78

Table 8: Estimation Results for SF36 Mental Health

	Pooled OLS						Fixed Effects						Random Effects					
	(1)		(2)		(3)		(1)		(2)		(3)		(1)		(2)		(3)	
Independent Variables	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
A. MALES																		
Regular Evening Shift	-3.028	-1.50	-2.641	-1.30	-1.983	-0.97	-1.742	-1.22	-1.560	-1.09	-1.624	-1.13	-2.338	-1.92	-2.209	-1.81	-2.009	-1.65
Regular Night Shift	-2.239	-1.13	-1.873	-0.96	-1.219	-0.65	-3.031	-1.86	-3.084	-1.88	-2.976	-1.82	-2.700	-1.94	-2.631	-1.88	-2.258	-1.62
Rotating Shift	-0.307	-0.37	-0.010	-0.01	0.051	0.06	-0.347	-0.39	-0.346	-0.39	-0.326	-0.37	-0.363	-0.53	-0.197	-0.29	-0.168	-0.24
Split Shift	2.422	1.38	2.528	1.46	3.165	1.77	0.682	0.40	0.674	0.39	0.690	0.40	1.314	0.86	1.264	0.83	1.516	0.99
On Call	-1.299	-0.95	-1.233	-0.90	-1.214	-0.91	-0.358	-0.33	-0.512	-0.47	-0.428	-0.39	-0.739	-0.77	-0.837	-0.87	-0.728	-0.76
Irregular Schedule	-0.465	-0.76	-0.595	-0.94	-0.696	-1.12	-0.438	-0.81	-0.472	-0.87	-0.411	-0.75	-0.446	-0.94	-0.529	-1.10	-0.526	-1.10
B. FEMALES																		
Regular Evening Shift	-0.055	-0.03	0.519	0.30	0.945	0.55	0.428	0.29	0.409	0.27	0.343	0.23	0.297	0.23	0.414	0.33	0.585	0.46
Regular Night Shift	2.869	1.32	3.268	1.48	4.020	1.90	0.499	0.24	0.455	0.22	0.531	0.26	1.761	1.08	1.904	1.16	2.254	1.38
Rotating Shift	0.414	0.42	0.423	0.43	0.903	0.94	1.797	1.79	1.737	1.72	1.399	1.39	1.223	1.50	1.175	1.44	1.166	1.44
Split Shift	0.634	0.24	1.622	0.62	1.474	0.58	4.104	2.24	3.995	2.17	4.112	2.24	2.882	1.76	3.067	1.87	3.026	1.86
On Call	-0.355	-0.22	-0.217	-0.13	-0.124	-0.08	-1.355	-1.11	-1.512	-1.23	-1.392	-1.13	-1.180	-1.08	-1.210	-1.09	-1.111	-1.01
Irregular Schedule	0.378	0.50	0.054	0.07	0.195	0.24	-0.658	-0.95	-0.866	-1.22	-0.829	-1.17	-0.255	-0.43	-0.536	-0.86	-0.490	-0.79

Table 9: Estimation Results for SF36 Physical Functioning

	Pooled OLS						Fixed Effects						Random Effects					
	(1)		(2)		(3)		(1)		(2)		(3)		(1)		(2)		(3)	
Independent Variables	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
A. MALES																		
Regular Evening Shift	-3.355	-1.96	-3.002	-1.74	-2.019	-1.14	-1.505	-0.85	-1.543	-0.87	-1.525	-0.86	-2.564	-1.79	-2.442	-1.70	-1.982	-1.39
Regular Night Shift	-5.490	-1.82	-4.959	-1.65	-4.367	-1.45	-1.356	-0.67	-1.475	-0.73	-1.488	-0.73	-3.582	-2.18	-3.337	-2.03	-3.046	-1.86
Rotating Shift	-1.069	-1.21	-0.937	-1.07	-0.926	-1.08	-1.778	-1.62	-1.773	-1.61	-1.761	-1.60	-1.418	-1.81	-1.332	-1.68	-1.330	-1.70
Split Shift	-2.260	-1.00	-2.007	-0.89	-1.064	-0.47	1.742	0.82	1.801	0.84	1.776	0.83	0.057	0.03	0.181	0.10	0.570	0.31
On Call	-1.126	-0.82	-0.751	-0.54	-0.733	-0.53	-1.248	-0.92	-1.047	-0.77	-1.028	-0.76	-1.128	-0.99	-0.849	-0.74	-0.790	-0.69
Irregular Schedule	-1.001	-1.52	-0.816	-1.21	-0.918	-1.41	-0.739	-1.10	-0.600	-0.88	-0.493	-0.73	-0.894	-1.60	-0.713	-1.25	-0.680	-1.20
B. FEMALES																		
Regular Evening Shift	-4.760	-2.48	-4.418	-2.30	-3.701	-1.97	1.881	1.18	1.753	1.09	1.835	1.15	-1.784	-1.33	-1.835	-1.37	-1.665	-1.25
Regular Night Shift	-1.203	-0.58	-0.988	-0.48	0.225	0.11	-0.946	-0.43	-1.101	-0.49	-0.921	-0.42	-1.163	-0.68	-1.222	-0.71	-0.589	-0.35
Rotating Shift	-0.764	-0.74	-0.829	-0.81	-0.173	-0.18	1.110	1.03	1.149	1.06	1.066	0.99	-0.009	-0.01	-0.049	-0.06	0.094	0.11
Split Shift	-0.508	-0.26	0.188	0.10	0.261	0.15	0.145	0.07	0.359	0.18	0.387	0.20	-0.267	-0.15	-0.022	-0.01	0.023	0.01
On Call	-3.732	-2.40	-3.437	-2.15	-3.357	-2.19	0.492	0.38	0.788	0.60	0.590	0.45	-1.121	-0.97	-0.722	-0.61	-0.956	-0.82
Irregular Schedule	-0.899	-1.24	-0.756	-0.97	-0.726	-0.96	0.582	0.79	1.140	1.50	1.091	1.45	-0.206	-0.33	0.217	0.33	0.140	0.22

APPENDIX

Table A. 1. The List of Independent Variables

Category 1	Age University or Above Tertiary Year 12 Foreign Born: Main English Speaking Country Foreign Born: All Other Countries Number of Children Ever Had Household Size Log Total Household Income Usual Weekly Hours of Work Separated Divorced Widowed Never married Homeowner
Category 2	Not Employed Unemployed Regular Evening Shift Regular Night Shift Rotating Shift Split Shift On Call Irregular Schedule
Category 3	Professionals Associate Professionals Tradespersons and Related Workers Advanced Clerical and Service Workers Intermediate Clerical, Sales and Service Workers Intermediate Production and Transport Persons Elementary Clerical, Sales and Service Workers Labourers and Related Workers Only Employed in One Job Employee of Own Business Employer/Own Account Worker Unpaid Family Worker Casual Tenure in Current Occupation Tenure in Current Employer

(Table A.1. continued)

Category 4	Weekly Physical Activity: Less than Once Weekly Physical Activity: 1 to 2 Times Weekly Physical Activity: 3 Times Weekly Physical Activity: More than 3 Times Weekly Physical Activity: Everyday No Longer Smokes Smoker Number of Cigarettes Smoked in Average Week Weekly Drinking: No Longer Drinks Weekly Drinking: Rarely, Less than Once Weekly Drinking: 1 to 4 Days Weekly Drinking: 5 to 7 Days Number of Standard Drinks Per Day: 1 to 2 Number of Standard Drinks Per Day: 3 to 4 Number of Standard Drinks Per Day: 5 to 6 Number of Standard Drinks Per Day: 7 to 8 Number of Standard Drinks Per Day: 9 to 12 Number of Standard Drinks Per Day: 13 or more
	Constant