Robustness Appendix for "Measuring Trends in Leisure: The Allocation of Time Over Five Decades"

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(posted online, available on the authors' websites)

1. Adjustment of the Time Trends Using a Broader Set of Demographics

The paper uses 72 demographic cells distinguished by age (5 groups), education (4 groups), sex (2 groups), and the presence of a child in the household (2 groups) to compute the fixed weight changes in the allocation of time by category. We do not distinguish respondents over the age of 59 by whether a child is present given the small number of older households with children. We have also redone the analysis dropping those older households with children and these households do not influence the results.

Due to the fact that the 1993 does not report marital status or the number of children in the household and not all surveys report the presence of young children in a consistent manner, we do not distinguish cells by these demographic controls. In this section, we explore the extent to which these demographic distinctions affect the main trends documented in the text.

To do this, we use only the 1965 and 2003 surveys, which report marital status, the number of children, and whether or not the age of the youngest child in the household is under the age of 4. Given these additional demographic data, we are able to define demographic cells by age range (3 groups: 21-34, 35-54, 55-65), education (2 groups: <=12, 13+), sex (2 groups), marital status (2 groups), the number of children (4 groups: 0, 1, 2, or 3+), and whether a child younger than 4 is present (2 groups). In order to make the sample sizes large enough in the cells given the smaller total sample in 1965, we only used 3 age ranges and 2 educational groupings as opposed to 5 and 4, respectively, used in the paper. Even with these broader categories, 5 categories are not present in either survey, and 51 categories are not represented in the 1965

survey. As a result, we drop the 426 respondents in the 2003 survey whose demographic cell is not represented in the 1965 survey, leaving us with a balanced sample of 112 cells.

Note that compared to the results in the text, there are three differences introduced beyond the additional demographics. First, we have dropped 426 respondents from the 2003 survey. Secondly, the pooled demographic weights (W) will also be different given the absence of the 1975. 1985, and 1993, surveys. Finally, as discussed above, we have reduced the age groups from 5 to 3 and the education groups from 4 to 2. We therefore re-perform our benchmark analysis using only the 1965 and 2003 surveys and the 24 demographic cells defined by these broader age and education categories as well as by sex and the presence of a child. This sample gives a comparable benchmark to assess the effect of adding controls for marital status as well as the number of children and whether a young child is present in the household.

Robustness Table R1 reports the key trends for the full sample, men, and women, using the adjusted benchmark demographics (24 cells) and the demographics containing marital status and the more detailed children controls (112 cells). These results are shown in specifications II and III of Table R1. As discussed above, to assess the importance of the additional demographic controls, one should compare specifications II and III. For reference, we also repeat the corresponding numbers from Tables 2 and 3 of the text. We list these results under specification I of Table R1. The additional demographic controls do not alter the conclusions documented in the text in any meaningful way.

2. Alternative Educational Analysis

The text used fixed educational attainment categories of less than high school, high school, some college, and college degree or more. The composition of these groups has changed over the sample, however. For example, the median respondent had a high school education in 1965, but has some college in 2003. In this exercise, we define “constant composition”

educational categories and repeat the main analysis of Table 5 in the text. Specifically, we split the sample at roughly the 70th percentile of educational attainment in the 1965, 1985, and 2003 surveys. This corresponds to high school or less in 1965 (which comprises 70.0 percent of the sample for men and 75.8 percent of the sample for women), and some college or less in 1985 and 2003. For men, this represents 70.6 and 70.2 of the sample in 1985 and 2003, respectively. For women, this represents 78.0 and 70.6 percent of the sample in 1985 and 2003, respectively. As in the text, all trends are reported for fixed demographic weights.

The results reported in Robustness Table R2 clearly indicate that the divergence of leisure by educational attainment is not due to changing composition of educational groups. The bottom 70 to 75 percent by education experienced gains in Leisure 2 of 7.5 and 5.7 hours per week for men and women, respectively. The corresponding gains for the top 25-30 percent were 0.9 and 1.0 hours per week for men and women, respectively. Moreover, Table 5's conclusion that most of this dispersion occurred post-1985 for men remains valid.

3. The Importance of Day of Week Effects

In the text, we re-weight the surveys so diaries from each day of the week are equally represented. This ensures that weekends are equally represented in each year. However, it may be the case that a given day of the week is not equally represented within a sub-sample of a particular survey. This potentially may influence the analysis when we look at sub-samples defined by sex or educational attainment.

To check for whether such a bias exists, we re-define our demographic groups including an additional differentiation based on whether a diary was completed on a weekday or a weekend. This doubles the number of demographic cells, yielding 144 potential cells (using the 72 demographic cells discussed in the text). However, not all cells are present in all five surveys. To obtain a balanced sample, we therefore drop respondents whose demographic cell is not

represented in all surveys. The number of dropped observations is 15, 17, 59, 198, and 499, for the 1965, 1975, 1985, and 2003 surveys, respectively. The advantage of adjusting for weekend/weekday representation comes with the disadvantage of small cell sizes and, therefore, potentially more measurement error.

Robustness Tables R3 and R4 report key trends using the expanded set of categories that control for weekends. Robustness Table R3 replicates key trends from Tables 2 and 3 in the text. The last column reports the corresponding 1965-2003 change from the text's tables for comparison. Robustness Table R4 replicates key trends from Table 5 in the text. The last row of each sub-section reports the corresponding 1965-2003 from the text for comparison. We see that the trends are robust to the alternative measurement. For the men/women splits, the 1965-2003 differences are all within 4/10ths of one hour per week of the ones reported in the text. The educational sub-samples are generally in line with those in the text, as well. Perhaps the most notable difference is a larger increase in Leisure 2 for college educated men and a corresponding sharper decline in market work. The difference arises because Leisure 2 is smaller in the 1965 survey in the alternative exercise than in the text (97.9 vs. 101.6). We tend to favor the text due to the sample size issue (and given that we have already weighted the data such that each day of the week is equally represented). There are 130 college educated men in the 1965 survey. Splitting this already small sample by weekends versus weekdays (as well as age and children) yields very small cells and undermines the representativeness of the demographic cell means.

4. The Importance of Seasonal Effects[1]

The 1965 and 1975 surveys did not collect diaries for every month of the year. This raises the potential concern of whether these diaries are representative of the entire year and therefore directly comparable to the year-round diaries in later surveys. This is of particular

[1] This section was motivated by a discussion of our paper by Justin Wolfers. We thank him for his comments and suggestions.

concern for 1965 as one of the two diary periods for that survey was 11/15 through 12/15/1965, an interval surrounding Thanksgiving and nearing the Winter Holidays. In this section, we address whether our results are biased by the short interval for which diaries were collected in 1965. To do so, we restrict our 2003 sample to diaries collected in the same weeks as those used in the 1965 survey, namely November 15 through December 15 and March 7 through April 29. This allows us to compare surveys from comparable points in the year at each endpoint of our sample.

The analysis otherwise replicates that in the text, in particular we do not restrict the other surveys, use the same sample selection criteria, and use the same demographic weights. This ensures the only difference between the robustness exercise and the text is the restriction to the 1965 survey's dates in 2003. Robustness Table R5 reports key trends using this alternative sample. The table also reports the comparable results from the text for reference.

The averages for 2003 from the restricted sub-sample of dates are fairly representative of the total year averages. For all activities and sub-samples, the means from the restricted dates are within one hour per week of the unrestricted means.

5. Alternative Measure of Meals at Work

This section addresses the issue of breaks and meals at work and how changes in measurement across surveys impact our various measures of leisure. As noted in the main text, the structure of the time use surveys differs between 2003 and the earlier surveys. For the measurement of time spent in most categories, the difference in survey design can be dealt with easily. The reason is that the 2003 sub-categories of time use are much more detailed than the earlier survey making it possible to aggregate the 2003 data into comparable categories to the earlier survey. However, one area where comparing 2003 to earlier surveys requires particular care is time spent "not working" while at work. For example, the early time use surveys have

explicit categories for "meals while at work" and "breaks while at work". No directly comparable categories exist in the 2003 survey.

In the text of our paper we discuss the difficulty of measuring leisure at work, particular in the absence of clear anchor points, such as scheduled breaks. The approach we take in our benchmark measures is to include meals and breaks at work in total market work, but not in core market work. For 2003, we include "meals as part of the job" as the comparable category to the earlier surveys' "meals at work." In a recent comment on our work[2], Valerie Ramey argues two things related to this point. First, that our benchmark approach is too narrow in 2003, and second, that meals at work should be included in leisure. This appendix addresses the first critique by broadening our measure of meals at work for 2003. Under this broader measure, we continue to find significant increases in leisure over the time period. Moreover, the critique does not affect our leisure measure 1 or the trends in any of our leisure measures prior to 2003. We also briefly address the second critique on conceptual grounds below and discuss this issue in greater detail in our response to the Ramey comment.[3]

In Robustness Table R6, we report the time spent on meals and breaks at work in 1965, 1975, 1985, and 2003 surveys for all households and then men and women separately. As with the results in the main text of the paper, all trends are demographically adjusted. We also report in the table our leisure measure 2, as defined in the paper.

The table shows a sharp decline between 1965 and 1985 in meals and breaks at work, despite the fact that meals and breaks were measured consistently across these surveys.[4] As other time researchers have pointed out, this decline reflects the changing nature of the work day. As the work day has become more amorphous, structured meal and break times have become less

[2] http://troi.cc.rochester.edu/~maguiar/timeuse_data/ramey_comment.pdf
[3] http://troi.cc.rochester.edu/~maguiar/timeuse_data/response_to_ramey.pdf
[4] In terms of meals versus breaks, in 1965 the average respondent reported 1 hour per week in breaks and 1.3 hours for meals. The respective numbers in 1985 are 0.6 and 1.0.

common. As a result, people report fewer meals at work as part of the time diary. This does not necessarily imply that eating at work does not take place.

There is internal evidence in the time diaries that highlights the difficulty in measuring meals at work. In 1965, 19% of the workers who worked 7 hours during a given day reported that they had no meal while at work that day. The comparable number in 1985 is 40%. These results are reported in Robustness Table R7. To reiterate, there is no change in survey design regarding meals at work between these two surveys. Where has the missing eating time gone? We are skeptical that people no longer (or rarely) eat at work. More likely, meals and breaks are under-reported absent clear anchor points, such as a contracted lunch hour or official "coffee breaks." If the breaks and meals at the workplace are informal, unscheduled, or unstructured, respondents may clump them together with work. This is one reason that time researchers advocate treating time spent at work on non-work activities as being a separate category of time use (distinct from other measures of eating or leisure).

The 2003 ATUS does not contain the categories "meals at work" or "breaks at work," as found in the earlier surveys. Our benchmark measure reported in the text defines the comparable category in 2003 as "work related meals." Such meals include business meals, lunch with clients, etc. That is, meals that are "part of the job." As seen from Table R6, such meals constitute a small part of the typical day. Ramey notes that our categorization is too narrow as it misses other meals at work. In particular, non-work related meals at the work place are included in "eating" in our benchmark 2003 categorization, while earlier surveys include these in "meals at work."

This is a fair critique, and it is important to clarify whether our admittedly overly narrow definition of meals at work in 2003 is a significant factor in our overall leisure trends. First, this issue only arises for 2003 and for leisure measures 2-4 and not our narrow "core" leisure measure 1 (watching TV, reading, etc.). We document significant increases in leisure prior to 2003 and in our leisure measure 1. Moreover, we now document that our other leisure measures continue to show large increases once we include all meals at the work place in "meals at work" for 2003.

For each time activity, the 2003 ATUS includes a variable indicating where the activity took place (at home, at the work place, etc). Our alternative measure of "meals at work" is all eating and drinking that takes place at the work place. This is consistent with the definition used in earlier surveys and more in line with our philosophy that eating at work is a distinct activity from eating at home. In 2003, this broader measure of eating at work constituted 1.1 hour per week for the average household, 1.3 hours per week for men, and 0.8 hours per week for women.[5] These measurements are shown in a separate row of Robustness Table R6 labeled "augmented meals and breaks at work." Again, the only numbers affected are those for 2003. Consistent with the trends in the data between 1965 and 1985 (where meals at work were measured consistently), 48% of households who worked at least 7 hours on the day of the survey report not eating at all while at work (Column III of Robustness Table R7). This is also consistent with the fact that the work day has become even more unstructured and, as a result, individuals are eating while working or choosing not to report their work-place eating at all.

By augmenting our measure of meals at work, we need to make the corresponding subtraction from our benchmark "eating" category in 2003. Recall that "eating" is a component of leisure measures 2-4, but not measure 1. We present the adjusted measures of leisure measure 2 as a separate line in Table R6. By construction, this correction reduces the overall increase in leisure measure 2 by the additional amounts reported for the augmented meals at work, namely by 1 hour for the entire sample, 1.2 hours for men, and 0.8 hours for women. These adjustments are not large enough to overturn the conclusion that that leisure measure 2 increased substantially

[5] The "where" codes allow us to examine any non-work activity that occurs at work (in addition to eating). For example, talking on the telephone with a relative while at work or engaging in personal computer use while at work can be distinguished from talking on the telephone with a relative and engaging in personal computer use at other locations. If we include all leisure (relaxing, socializing, etc.) time spent at work using the "where" code into the measure of "eating at work", eating at work in 2003 would increase from 1.1 hour per week to 1.6 hours per week. We do not include these activities into our base analysis because they may not have been included in the measures of "meals" or "breaks" at work in the earlier surveys. However, a conceptual argument can easily be made for their inclusion. For completeness, we simply note that these activities account for 0.7 hours per week for men and 0.4 hours per week for women in 2003.

since 1965: the adjusted increase in leisure measure 2 is 4.5 hours per week for the full sample, 5.0 hours per week for men and 4.1 hours per week for women.

We conclude this section by noting that Ramey argues for a much larger adjustment to leisure measure 2. Our augmented measure addresses the robustness of our results to changes in survey design. Ramey proposes an alternative adjustment that is essentially a conceptual difference rather than a difference in measurement. Specifically, she argues that all meals and breaks at work should be included in leisure. We argue that meals at work should be included in ancillary work activities (but not core market work). In terms of magnitudes, the decline in meals at work, as reported in Table R6, is 1.2 hours per week for our augmented measure and 2.2 for our benchmark measure. This is the basis of Ramey's argument that the increase in leisure needs to be adjusted down by an additional 2.3 hours per week for the average respondent, 3.3 hours per week for men, and 1.5 hours per week for women. To be clear, these latter adjustments relative to our augmented measures are not issues of measurement, but of conceptual classification. We argue at length in our response to Ramey[6] that meals at work should not be included in measures of leisure. To summarize, we feel there are two main issues. One, as stated above, is that time at the work place is inherently different than one's own time. Second, and perhaps more importantly, as the work day becomes less structured, there is reason to believe that respondents are moving meals at work into work. The evidence presented in Table R7 suggests that this indeed takes place. For both of these reasons, we, along with most researchers using time use surveys, do not include meals and breaks at work in leisure.

[6] http://troi.cc.rochester.edu/~maguiar/timeuse_data/response_to_ramey.pdf

Robustness Table R1: Trends using Expanded Demographic Controls
Change 1965-2003 (Hours per Week)

	I. Results Reported in Text With Benchmark Demographic Controls (See Tables 2 and 3)			II. Results Using New Restricted Sample and Limited Demographic Controls			III. Results Using New Restricted Sample and Expanded Demographic Controls		
Time Use Category	Full Sample	Men	Women	Full Sample	Men	Women	Full Sample	Men	Women
Total Market Work	-4.27	-12.05	2.48	-3.28	-11.30	3.85	-4.00	-10.84	2.08
Non-Market Work	-3.78	3.75	-10.31	-3.81	4.11	-10.86	-2.80	4.21	-9.03
Child Care	1.83	1.80	1.86	2.10	2.06	2.13	2.57	2.15	2.95
Leisure Measure 2	5.50	6.20	4.89	4.31	5.20	3.53	3.65	4.81	2.63
Number of Cells	72			24			112		

Notes: See above text for details. Results reported in the text use the following demographic cells: 5 age ranges/ 4 education / 2 sex / 2 fertility.

Demographics Cells in Specification II =
3 age ranges (21-24,35-54,55-65)
2 education (high school or less, some college or more)
2 sex
2 fertility (have child, no child)

Demographics Cells in Specification III =
3 age ranges (21-24,35-54,55-65)
2 education (high school or less, some college or more)
2 sex
4 fertility (number of children = 0, 1, 2, 3+)
2 young child (no child<=4 years, child <=4 years)
2 marital status

Only cells represented in both surveys used in analysis.

Robustness Table R2:
Alternative to Table 5's Time Use by Educational Attainment,

	Education Split			
Category/Year	Bottom 70 percentiles (approximate)	Top 30 percentiles (approximate)	Bottom 75 percentiles (approximate)	Top 25 percentiles (approximate)
Panel A: Total Market Work				
	Men		Women	
1965	52.27	50.70	21.25	24.24
1985	43.92	41.65	22.74	25.93
2003	37.74	44.96	23.35	30.89
Change 1965 – 2003	-14.53	-5.73	2.11	6.66
Panel B: Total Non-Market Work				
	Men		Women	
1965	9.24	10.22	34.36	30.62
1985	13.65	14.89	27.71	24.79
2003	13.33	13.73	23.00	20.82
Change 1965 – 2003	4.09	3.50	-11.36	-9.80
Panel C: Leisure 2				
	Men		Women	
1965	102.53	100.59	103.10	102.11
1985	106.75	107.02	109.40	105.99
2003	110.02	101.44	108.78	103.10
Change 1965 – 2003	7.48	0.85	5.68	1.00

Notes: Exact percentiles for men are 70.0, 70.6, 70.2 for 1965, 1985, and 2003, respectively. The corresponding percentiles for women are 75.8, 78.0, and 70.6.

Robustness Table R3: Weekend/Weekday Controls and Sex Sub-samples

Time Use Category	1965	1975	1985	1993	2003	Difference: 2003–1965	Difference: 2003–1965 *from text*
				Men			
Total Market Work	52.11	46.79	43.89	42.39	40.12	-11.99	-12.05
Total Non Market Work	9.79	10.54	14.13	12.35	13.25	3.46	3.75
Child Care: Total	1.43	1.38	1.67	1.58	3.30	1.87	1.80
Leisure 2	100.76	105.32	106.13	108.78	107.36	6.60	6.20
				Women			
Total Market Work	22.85	22.47	23.66	25.21	25.38	2.53	2.48
Total Non Market Work	32.85	28.14	26.88	23.66	22.38	-10.47	-10.31
Child Care: Total	5.61	4.59	5.39	4.74	7.60	2.00	1.86
Leisure 2	102.39	108.02	108.67	110.88	107.19	4.80	4.89

Notes: This Table replicates some of the results from Tables 2 and 3 of the text including specific weekend and non-weekend/ demographic interactions. See the discussion in the text of the robustness appendix for details. All data are reported in hours per week.

Robustness Table R4:
Weekend/Weekday Controls and Education Sub-samples

	Years of Schooling							
Year/Category	<12	12	13-15	16+	<12	12	13-15	16+
	Panel A: Total Market Work							
	Men				Women			
1965	51.38	52.74	51.59	52.13	19.34	23.21	22.37	26.00
1985	42.55	42.84	47.62	43.76	18.53	23.70	26.22	26.24
2003	34.13	39.61	40.96	45.03	15.34	25.24	28.86	32.23
Change 1965 – 2003	-17.25	-13.13	-10.63	-7.10	-4.00	2.03	6.49	6.23
Change reported in text	-18.02	-13.69	-12.63	-4.41	-2.43	2.03	6.52	4.26
	Panel B: Total Non-Market Work							
	Men				Women			
1965	9.51	9.10	10.08	10.83	35.87	33.25	31.89	30.04
1985	14.57	13.30	14.49	14.74	28.24	27.52	26.31	24.83
2003	12.66	13.46	13.13	13.51	26.08	22.54	20.29	20.40
Change 1965 – 2003	3.15	4.36	3.05	2.68	-9.79	-10.71	-11.60	-9.64
Change reported in text	3.43	4.48	3.55	3.12	-10.10	-10.81	-11.45	-8.51
	Panel C: Leisure 2							
	Men				Women			
1965	103.62	101.98	99.12	97.86	104.76	101.74	102.01	101.73
1985	107.29	107.56	103.52	105.00	113.08	108.58	107.08	106.05
2003	115.31	108.62	104.32	101.37	113.72	107.87	104.45	102.03
Change 1965 – 2003	11.69	6.64	5.20	3.51	8.96	6.13	2.44	0.30
Change reported in text	12.22	7.28	6.21	-0.20	7.88	6.31	2.73	1.33

Robustness Table R5: Seasonal Adjustment

Time Use Category (Hours per Week)	1965	2003 (restricted dates)	2003 *from text*	Difference: 2003–1965 (restricted dates)	Difference: 2003–1965 *from text*
			Full Sample		
Total Market Work	35.98	31.93	31.71	-4.05	-4.27
Total Non Market Work	22.09	18.39	18.31	-3.70	-3.78
Child Care: Total	3.67	5.78	5.50	2.11	1.83
Leisure 2	102.23	106.96	107.73	4.73	5.50
			Men		
Total Market Work	51.58	39.91	39.53	-11.67	-12.05
Total Non Market Work	9.67	13.14	13.43	3.46	3.75
Child Care: Total	1.44	3.15	3.24	1.71	1.80
Leisure 2	101.68	107.28	107.88	5.60	6.20
			Women		
Total Market Work	22.45	25.01	24.93	2.56	2.48
Total Non Market Work	32.86	22.95	22.55	-9.91	-10.31
Child Care: Total	5.60	8.07	7.46	2.46	1.86
Leisure 2	102.70	106.69	107.59	3.98	4.89

Notes: Restricted dates for 2003 refer to 3/7-4/29 and 11/15-12/15, the corresponding dates during which the 1965 survey interviewed its respondents.

Robustness Table R6: Meals and Breaks at Work

Time Use Category (Hours per Week)	1965	1975	1985	2003	Difference: 2003–1965
Panel A: All					
Meals and Breaks at Work (published paper)	2.3	2.0	1.6	0.1	-2.2
Leisure Measure 2 (published paper)	102.2	106.6	107.8	107.7	5.5
Augmented Meals and Breaks at Work	2.3	2.0	1.6	1.1	-1.2
Augmented Leisure Measure 2	102.2	106.6	107.8	106.8	4.5
Panel B: Men					
Meals and Breaks at Work (published paper)	3.3	2.6	2.1	0.1	-3.1
Leisure Measure 2 (published paper)	101.7	105.3	106.8	107.9	6.2
Augmented Meals and Breaks at Work	3.3	2.6	2.1	1.3	-1.9
Augmented Leisure Measure 2	101.7	105.3	106.8	106.7	5.0
Panel C: Women					
Meals and Breaks at Work (published paper)	1.5	1.6	1.2	0.1	-1.4
Leisure Measure 2 (published paper)	102.7	107.8	108.7	107.7	4.9
Augmented Meals and Breaks at Work	1.5	1.6	1.2	0.8	-0.7
Augmented Leisure Measure 2	102.7	107.8	108.7	106.8	4.1

Notes: This table reports benchmark and augmented measures of meals and breaks at work for 2003 and the corresponding benchmark and augmented leisure measure 2. All numbers for 1965, 1975, and 1985, remain the same as reported in the text. The published paper meals and breaks at work for 2003 includes "work related meals." The augmented measure includes work related meals as well as any eating and drinking that takes place at the work place. The augmented leisure measure 2 is constructed from the original leisure measure 2 by subtracting the difference between the augmented meals and the original meals.

Robustness Table R7: Meals and Breaks at Work: Worked at Least 7 Hours that Day

	1965 Meals and Breaks at Work	1985 Meals and Breaks at Work	2003 Eating and Drinking While at Work
Fraction Reporting Zero	19%	40%	48%
Median Hours per Week	4.1	3.5	1.2
75^{th} Percentile Hours per Week	6.4	5.8	3.5

Notes: Sample consists of those who report at least 7 hours of regular market work on the day of the survey. The first row indicates the fraction of respondents reporting zero time spent in meals and breaks at work (for 2003, the corresponding category is eating and drinking at the work place). The remaining two rows report the median and 75^{th} percentile response, respectively, in hours per week.