HOUSEWORK NOW TAKES MUCH LESS TIME

85 YEARS OF US RURAL WOMEN’S TIME USE

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ABSTRACT

Based on her analysis of published tables from US homemakers’ 1924-1932 week-long time-use diaries collected by the US Department of Agriculture, Vanek (1974) concluded that housework time had not declined over the previous half-century—despite the diffusion of many ‘time-saving’ home technologies. Although frequently challenged, this claim still survives in parts of the sociological literature; we use newly available evidence to refute it. Analysis of the original USDA diaries (many of which have now been recovered from the US National Archives) alongside more recent diary micro-data from the American Heritage Time Use Study reveals a pair of clear and contrary trends: a continuing decline in women’s core housework (cooking and cleaning) partially offset by an increase of time in childcare and shopping. Names and addresses attached to the original diaries allow the identification of >93% of the USDA diarists in one or both of the 1920 and 1930 US Federal Censuses. Analysis (Oaxaca decomposition) of the household- and individual-level information from this source shows that most of the historical time-shifts result, not from changes in family demography or women’s growing attachment to paid work over this period, but from ‘behavioural’ change, reflecting in part the spread of labour-saving domestic technology.

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1. THE ‘HOUSEWORK TIME PARADOX’

Changes in time use over historical time

The ‘housework time paradox’ was formulated by Vanek on the basis of a secondary analysis of published tables from the 1925 Purnell Act homemaker diary studies: “As one might expect, working women spend less time in housework than their mothers and grandmothers did some 50 years ago. Women who are not in the labor force however, spend just as much time” (1974, 116). What, then, is the impact of supposedly ‘labour-saving’ equipment and materials in the home? Vanek’s 1974 Scientific American article has been well-publicised and widely debated. It parallels a somewhat more nuanced secondary analysis of similar historical materials by Converse and Robinson (1974).

Mokyr (2000) terms this “just as much time” phenomenon the ‘Cowan paradox’, referring to Schwartz-Cowan’s More Work for Mother (1980), although Schwartz-Cowan herself cites Vanek’s work only marginally. He adds to Cowan’s own explanation of the phenomenon in terms of the spread of middle class standards of domestic comfort, an additional household-level reflection of the public understanding of the importance of sanitary improvements and personal hygiene in maintaining good health (Mokyr 2000). Neither Cowan nor Mokyr, however, provide any direct empirical evidence of historical change in time use.

Several researchers, most recently Ramey (2009) and Bittman, Rice and Wajcman (2004) express concerns about this historical account of unchanging time devoted to housework. The figures presented by Vanek in her 1974 article are themselves not entirely supportive of the popular version of this thesis. In particular, there is an uncomfortable slide from the more specific term ‘housework’ (i.e. cleaning, cooking and laundry) used in the previously-quoted opening sentence of the article, which has an obvious and direct relation to domestic equipment and materials, and the more general category ‘household work’ which emerges as the subject of the later statistical section of her paper. Unquestionably, the household work or domestic production (equivalent to the unpaid work identified by the ‘third person criterion’ (Reid 1934; Hawrylyshyn 1976) is of considerable importance for the wellbeing of the populations of advanced economies. This, however, is a much broader category than ‘housework’.

Household work, in Vanek’s (1974) analysis, adds childcare and other caring activities, domestic management, domestic travel and shopping time to housework—activities that have a much less straightforward connection to household equipment and materials. We note that Vanek’s later more extended, but much less widely cited (1978) analysis of the same materials, contains neither the elision of unpaid work categories, nor the claim of constancy of housework. Unquestionably, in Vanek’s transcription of the original published tables, in the work of subsequent researchers using the published tables (e.g. Bryant 1996; Ramey 2009) and in our own reanalysis of the reconstructed individual data, time in non-housework domestic production has increased substantially since the 1920s. The issue remaining to be resolved relates to the specific category ‘housework’.

Irrespective of the housework/household work issue, the basis for Vanek’s assertion of non-employed women spending “just as much time” (1974, 116) is rendered problematical, as Ramey (2009) observes, by two connected statistical issues; unobserved heterogeneity and sub-sample selection. Vanek’s claim is that the time devoted to the unpaid work activities of non-employed ‘homemakers’ over the period from the 1920s to the 1960s remained constant. However, over this period the number of women moving into paid employment increased dramatically. Fewer than 10% of married US women had paid jobs in the 1920s, whilst more than 40% had jobs in the late 1960s, and the proportion has continued to rise.
We may sensibly hypothesise that the heavier the burden of household work (based on the number and age of children, size and condition of home and garden, etc.), the greater the disincentive for women taking on the additional burden of paid employment. As more married women entered the workforce, the average characteristics of the remaining homemakers’ households changed. We suspect that this implies a regular historical increase in the proportion of dedicated homemakers who have larger houses and gardens, younger and more demanding children, and so on—a species of ‘selection effect’. The range and scale of tasks undertaken by dedicated homemakers becomes, as a result, progressively broader and more comprehensive. We infer, on this basis, that the average homemaker remaining outside waged work in 2010 carried heavier household responsibilities than did her unwaged counterpart in 1925.

The historical changes in the process of ‘selection’ into homemaking, implying changes in the household circumstances of the average homemaker, mean that homemakers’ housework (as opposed to household work) time totals are not strictly comparable over successive points in time. What we see in Vanek’s (1974) historical comparison, in essence, may be an inter-temporal race between the labour-saving effects of domestic equipment and the increasing average burden of cooking, cleaning and laundry on a diminishing group of increasingly hard-pressed housewives. Schwartz-Cowan’s (1983) and Mokyr’s (2000) inference that, given the diffusion of labour-saving equipment over this period, the observed constancy in household work time is attributable to meeting higher standards, takes no account of this progressive historical selection of homemakers into ever-more burdensome households. Even if we were to find evidence of Vanek’s historical constancy in non-employed women’s housework, the comparison would be problematical because of un-controlled-for heterogeneity.

However, we do not in any way deny the proposition that standards of provision may have risen as a result of the availability of domestic labour-saving equipment. Standard economic theory suggests that higher labour productivity rates in private households may, under some circumstances, induce growth in household output. To use Ramey’s (2009, 6) terminology, technological advance (e.g. increasing the efficiency of laundry equipment) might lead either to scale effects (increasing home laundry work) or substitution effects (e.g. increasing childcare time). Nevertheless, despite the indeterminacy of the theoretical predictions, we consider it unlikely that the former category should permanently outstrip the latter. The twin tub washing machine (together with wash-and-wear fabrics) may have induced our grandfather to ditch his detachable collars and wear a clean shirt each day, thereby increasing this part of our grandmother’s work four-or five-fold. But the advent of the automatic washing machine a few years later would not induce him to wear four or five shirts a day! The usefulness of domestic technology for each specific area of provision diminishes at the margin, as particular wants are progressively satiated.

**A fallacy: Cross-sectional differences do not imply historical changes**

The problem is made more confusing by the cross-sectional version of the Vanek-Cowan paradox, which can be traced back to a slightly earlier source. Robinson, Converse and Szalai (1972) identified a weak or even negative cross-sectional association between national averages of time devoted to housework and the nationally available levels of domestic equipment, which emerged from the 1965 UNESCO-funded 12-nation cross-national time use study. They remarked that “....there might well be a fully counter-intuitive relationship between the efficiency of domestic technology and the amounts of time given over to household obligations” (Robinson *et al.* 1972, 125). Somewhat similar claims, based on cross-sectional comparisons, also emerge in some of the 1930s USDA Bulletins (e.g. Wilson 1929). But it would be incorrect to infer from this relationship that any future diffusion of labour-saving equipment would be accompanied by increases in housework time.
More recent debates on the cross-sectional version of the thesis—that households with greater access to domestic technology spend more time in housework—illustrate the nature of the fallacy. For example, Bittman et al. (2004) infer, on the basis of correlations in cross-sectional data, that owning specific items of domestic equipment encourages household members to spend more time (or at least to fail to significantly reduce time in) various domestic tasks, irrespective of whether or not those tasks are directly associated with the particular equipment. They suggest, for example, that owning a lawnmower or edge-trimmer increases the amount of time men allocate to gardening (by 9 minutes per day, one hour per week) and housework in general (15 minutes per day, one hour 45 minutes extra housework per week) “even when the type of dwelling (for example, free-standing bungalow versus apartment) is held constant” (Bittman et al. 2004, 410, Table A3).

We view this as a mis-statement of the likely causal priority: it is more probable that some aspect of the household circumstances leads both to the acquisition of domestic equipment and to a higher level of housework time. Apartments and houses, as well as any gardens attached to them, may be of any size, just as one three-year-old child may impose very different burdens from another, and the extent of housework required may vary independently of household income. So merely entering the type of housing, level of income, numbers and ages of children, and so on, as controls in a regression equation predicting housework, nevertheless leaves heterogeneity insufficiently controlled-for.

Straightforwardly, it is likely to be the on-average larger houses and gardens of owners of dishwashers, lawnmowers, and so on, that lead to the extra housework or gardening, and emphatically not their access to the equipment. At any and each point in historical time, owners of more labour-saving equipment might spend longer in housework than do owners of less equipment. Nevertheless, we conjecture that, as time passes and more labour saving equipment diffuses across households, average housework time might still be declining. Indeed, in what follows, we demonstrate unambiguously such a decline amongst US rural women since the 1920s.

We will see that the story for those other activities—childcare and shopping—that make up the margin between Vanek’s ‘housework’ and her ‘household work’, is quite different. Childcare time requirements have been transformed by perceived (or perhaps misperceived) escalating risks to child safety, needs for higher levels of parental investment in children’s human capital and associated processes such as “cohort crowding” resulting in a parental ‘arms race’ in the provision of credentials for college entry (Bianchi 2000; Sayer et al. 2004a, 2004b; Ramey and Ramey 2010, 1).

Technical and organisational change in shopping behaviour occurred most dramatically in the US in the period between the 1920s and the 1970s survey periods (and in Europe 10-20 years later). In the 1920s, aside from the self-provisioning customary in farm households, small items might be purchased from relatively local fully serviced stores, with storekeepers selecting goods, often with associated delivery services, while other specialised or larger items would be purchased from catalogues. But by the mid-1970s, much more of the shopping would have been carried out from self-service ‘supermarket’ stores, which require shoppers to locate and select items themselves and then queue to pay for them—consequently increasing their time in the store. Furthermore, the larger the supermarket, the longer, on average, both the journey to it—implying increasing reliance on private automobiles—and the walk from the parking lot to the store, again increasing the time taken by each shopping event. This is a feature of ‘self-servicing’ predicted by Gershuny (1978) and subsequently observed from the cross-national comparative historical evidence in Gershuny (2000).
2. DATA AND SAMPLE RECONSTRUCTION METHODS

Original data collection: Farm and non-farm rural women

We have been working on materials sometimes referred to as the *Purnell Act time diary studies* (Ramey 2009) collected by the United States Department of Agriculture (USDA) which are the very earliest time diaries collected in the USA. Bevan (1913), who is sometimes misidentified in the literature as the pioneer researcher in this field, did not in fact use a true diary method. The time use diary data first reported by the chief of the Economics Division of the of the USDA Bureau of Human Nutrition and Home Economics, Hildegard Kneeland (1929), formed the basis for academic sociological studies during the 1930s (e.g. Lundberg et al. 1934, Sorokin and Berger 1939).

The women participating in Kneeland’s rural homemaker studies were asked to complete a detailed record of their time use for seven consecutive 24-hour periods. The time devoted to various homemaking tasks by other household members, as well as paid help, was also recorded. The homemakers described activities in their own words, listing them consecutively as they occurred throughout the day, with a minimum interval of five minutes (USDA 1944). The USDA material uses several versions of the activity coding fame (1925, 1926 and 1928) with only a few minor differences. The 58 activity codes include 31 relating to unpaid work, 18 to personal care and leisure and 9 to farm and other paid work. The only rural homemaker information recovered to date is the researcher-produced diary-based weekly minutes ‘summary records’ (time budgets) derived from diaries completed by homemakers living in 15 states, with the largest numbers residing in New York, California and Michigan.

We matched over 93% of the names and addresses of the 566 researcher-prepared farm and non-farm rural households ‘summary records’ to Census records. The primary information source was US Federal Census micro-data from 1920 to 1940 (accessible because of the relatively short 70-year embargo in the US, as compared with 100 years in the UK and elsewhere). Variations in the spelling of family and given names, as well as household relocations both complicated the matching process, and we frequently made use of additional sources to resolve problems of identification including Birth, Death and Marriage Indexes; Voting Registers; Social Security Numbers; City Directories; Military draft records; immigration and travel documents; and other material (such as obituaries and newspaper articles).

No direct evidence of the USDA’s general methods of sample selection, or of the sampling frame for the 566 week diaries from rural (farm and non-farm) women in the surviving sample, has as yet come to light (the recruitment mode for the 77 College Women is set out below). We have chosen to interpret the materials straightforwardly, as Kneeland suggests in her 1929 article, as a representative sample of US rural women.

Although no diary records or ‘supplementary information’ (household questionnaires) for the rural women have yet been discovered, work to locate them in Experiment Station and land-grant university archives is underway. On the basis of our supposition that the 566 records discussed here are drawn from the 808 reported by the USDA (1944), it is possible that 242 ‘summary records’ are missing (see further discussion in our Methods section below).

Vanek (1974) also referred to a parallel ‘College Women’ study, collected by Kneeland in 1930 and 1931. These diarists were drawn from the 1880 to 1893 alumnae of the socially exclusive ‘Seven Sisters’ East Coast US colleges. Approximately 2000 (all of the contactable alumnae) were invited to contribute week-long diaries, although only 77 complete datasets from what might better be considered an ‘elite’ sample have survived. We suspect that this is close to the achieved sample—
including the original seven-day diaries, detailed ‘supplementary information’ records
(individual/household questionnaire) and associated summary records—which will permit future
methodological work. This group (for which we achieved >95% Census matching) is excluded from
the present analysis on the grounds of its essentially unrepresentative nature. We note, however,
that the initial totals of housework time for this group of women are broadly similar to those of the
rural women.

Reconstructing the rural sample characteristics using US Federal Census data

To date, we have identified (from the 566 rural diaries) 904 Census matches for 528 diaries; 7 from
1910, 390 from 1920, 404 from 1930 and 7 from 1940. All of the 528 successfully matched diarists
have information from at least one of the 1920 or 1930 Censuses. For our analysis, we have relied
mainly on information from the available Census closest to the diary date. Since the majority of the
diaries were collected in 1928, we have used mainly the 1930 Census materials, calculating the
diarist’s and other household members’ ages by subtraction. To simplify the task of household
reconstruction, we checked that no deaths or separations occurred between the diary date and the
subsequent Census. In the case of 1924 diaries, we identified household members born after 1920
from the 1930 Census, wherever this was available. These methods enabled us to identify an under-
representation of women aged 20-29 and 50-59 in the 528 cases, so we reweighted the sample to
approximately reproduce the 1920s rural women’s age distributions while maintaining the same
overall sample size.

The recovered diary materials provide some internal evidence suggestive of what may have
happened to the missing 242 summary records. These were painstakingly calculated by USDA or
Experiment Station researchers, who first coded the diarists’ own-words descriptions of their
activities into the 58 activity categories and then summed the hours and minutes in each category,
to produce the individual ‘summary sheets’ (time budgets).

Completing any form of continuous time diary is onerous and the seven consecutive days of
recording required by the USDA diarists must have been particularly demanding. On the basis of
experience with other time use surveys, we would expect approximately one third of the diaries to
have some substantial amount—perhaps 30 minutes out of the 1440 minutes of the day—of
unclassified, unclassifiable or otherwise missing time. In our reconstruction, however, only six of the
528 Census-matched cases have 30 or more minutes of missing time and we suspect that at least
some of these cases are undetected results of our own transcription errors.

We also have some direct evidence from the more complete College Women’s records in the form of
letters sent from Kneeland to the diarists, thanking them for their participation but remarking that
their diaries had been excluded from the study because of missing data. A considerable number of
the rejected College Women’s diaries are stored in the US National Archives, but unaware of their
significance at this early stage in our research, we neglected to count or record them. Our tentative
conclusion is that the surviving 566 summary records represent only the perfect or near-perfect
seven-day records selected from the original 808 responses.

Comparator studies from the AHTUS

In what follows, we compare the 528 Census-matched 7-day time-budgets (i.e. derived from 3696
sample days) with two sets of later materials drawn from the American Heritage Time Use Study
(AHTUS) (Fisher and Gershuny 2015). We do not draw on the 1965 materials used for this purpose
by Vanek (1974). The original 1965-66 ‘Robinson-Converse’ material (drawn from Alexander Szalai’s
1972 UNESCO-funded multi-national comparative study) used by Vanek comes, as she herself notes,
from a study of urban households with at least one member in paid employment: the parallel 1965 US National Time Diary Study includes only 249 days of data from rural women aged 18-65.

However, the 1975 University of Michigan Time Diary Study provides 982 rural women’s days, which just about reaches the minimum sample size usually required for this sort of comparison (Harvey 1993, 204) and the modern American Time Use Study provides 6939 rural women’s days over the period 2003-2011. The consequence of this analytic decision is that we cannot properly distinguish whether the changes took place before the 1960s or between 1965 and 1975. However, informal comparisons of our three-time-point estimates with the mixed urban and rural 1965 data suggest that changes occurred through both the earlier and the later periods. The compensating advantage from this approach is that we reduce the uncertainty associated with the mostly urban sample (or alternatively, the much higher standard error associated with the small rural part) of the 1965 sample. Unlike previous attempts to establish long-term estimates based on the Purnell studies, our three-time-point 1920s-1975-2000s version relies on a reasonably consistent sample base.

3. RESULTS

Changes in means of time devoted to work

The two panels of Figure 1 report 1925-2011 changes in mean times devoted by rural women to eight categories of paid or unpaid work, together with 95% confidence intervals calculated from simple standard errors. The changes that emerge are sufficiently large that statistical significance can be read off directly from the standard errors in all cases where there are any substantial trends.

The two panels of Figure 1 show, respectively, the four work-related activity categories that have increased over the period and the four activities that have decreased, for the entire reweighted rural women’s sample.

First, and most dramatically, we see the decline in time devoted to cooking, clearing and general household cleaning. The 1920s sample had a mean of 271 minutes per day (95% confidence interval +/- 6 minutes). By 1975, this had fallen by nearly one-and-three-quarter hours to 168 minutes (+/- 9 minutes) and by the 2000s, it had fallen a further hour per day to 108 minutes (+/- 3 minutes); a clear, monotonic, unambiguously significant decline in a core domestic task. Laundry time was nearly halved, from 48 minutes/day (+/- 2 minutes) in the 1920s, to 25 minutes (+/- 3 minutes) in 1975 (again a clearly significant decline) but then no change (again 25 minutes, +/- 1 minute) in the 2000s.

Other aspects of clothing or textile care (mending, knitting and sewing) also show a significant monotonic trend over the 85-year period, falling from 51 minutes (+/- 4 minutes) in the 1920s, to 15 minutes (+/- 3 minutes) in 1975 and to 2 minutes per day (+/- 1 minute) in the 2000s. This self-provisioning activity, which loomed so large at the beginning of the last century, has now virtually disappeared. Similarly, time devoted to running and maintaining basic utilities such as heating, water and waste disposal fell from 17 minutes per day (+/- 2 minutes) in the 1920s to 6 minutes per day (+/- 3 minutes) in 1975 and again, although less unambiguously significantly, to 4 minutes (+/- 1 minute) in the 2000s.
**Figure 1a**
US farm and town married women 1920s to 2000s: Decreasing work-time categories.

**Figure 1b**
US farm and town married women 1920s to 2000s: Increasing work-time categories.
We have no sound basis for estimating the husband’s contribution to household work in general in the 1920s—although Gershuny and Robinson (1987) and many subsequent analyses have shown that these increased only marginally from the 1970s onwards. At present, we have no direct measures of levels of access to domestic equipment for the 1920s rural sample (although we are still searching for the original supplementary records that collected this information, and we already have this for the 1930-31 college sample). Nevertheless, given the generally low levels of availability of domestic equipment in rural homes prior to the electrification programmes of the 1930s, it would seem perverse not to assume that in aggregate terms, overall domestic standards of cleanliness and comfort, at least have not fallen over the period covered by our data.

On this basis (and holding to one side the issue of labour market participation discussed in the next subsection of the paper) we take the view that, in each of the four cases, these historical changes reflect, at least in part, various sorts of ‘labour saving’ technology. In the case of household cleaning, the historical change reflects the diffusion of electric vacuum cleaners and similar equipment, combined with improved space-heating methods that produce less dust, as well as more easily maintained floor and other surface coverings (vinyl, wall-to-wall carpeting and durable synthetic laminates). For cooking, the changes reflect more efficient stoves and improvements in food storage (first canning, ice coolers, then gas or electric refrigerators and freezers) combined with the increasing availability of processed food products. Laundry work was reduced by the introduction of electric (and later fully-automatic) washing machines combined with wash-and-wear fabrics, although the levelling-off post-1975 presumably reflects a growing tendency for daily replacement of soiled clothing. Sewing and mending clothing has now been almost entirely supplanted by manufactured, easily to replace ‘off-the-peg’ apparel.

Child and adult care time (second panel of Figure 1) by contrast has increased, again quite dramatically, from 35 minutes per day (+/- 4 minutes) in the 1920s, to 59 minutes (+/- 5 minutes) in 1975, and again to 88 minutes (+/- 4 minutes) in the 2000s. The reasons for this increase, well-substantiated for the more recent period, but revealed here also for the earlier, are widely discussed in the literature (e.g. Bianchi et al. 2000). Two distinct explanations for this growth are advanced in the case of childcare. First, declining completed family size; smaller families may have led to Mark-Twain-type “put all your eggs in one basket, and then watch that basket” overprotectiveness.

Second, a growing pressure for extra parental time investment in children’s social and cultural capital, exerted by the growth of meritocratic selection into privileged educational institutions, and experienced disproportionately by middle class households (Sayer et al. 2004a, 2004b). Public health and medical advances leading to increased longevity also tend to increase adults’ time devoted to elder-care.

And we would add that—particularly apparent to diary researchers who are able to look at the detailed record of simultaneous activities and ‘multitasking’—the historical processes of domestic mechanisation and automation may lead to the unmasking of household caring activities that might previously have been hidden by the simultaneous cooking cleaning or laundry task (e.g. “scrubbing clothes while watching the children playing”).

Rural women’s time devoted to household management does not seem to have changed substantially; around 8 minutes per day in the 1920s and 10 minutes in the 2000s. Both shopping and associated travel time have been affected by major technical and organisational changes. Part of the growth over the initial part of the period can be explained simply as a volume effect, an enormous growth in the range and quantity of consumption of retail goods, coupled with the previously noted decline in self-provisioning. But from the 1930s to 1960s onwards, neighbourhood stores (perhaps with mail order or delivery services) have been progressively replaced by increasingly distant self-serviced supermarkets, requiring substantial increases in shopping and related travel time. We see that these increased remarkably over the first part of the period, from 23
minutes per day (+/-2 minutes in the 1920s, to 78 minutes (+/- 6) minutes in 1975. Subsequently, the trend levelled off, to just 80 (+/- 3) minutes in the 2000s.

The eighth category, work in the farm or the general labour market, was of some importance to the rural women of the 1920s, with a mean of just less than one hour per day (57 minutes, +/- 6). But for the equivalent group in 1975, the mean of paid work was more than two-and-a-half times higher (154 minutes +/- 14) and by the 2000s had reached 217 minutes per day (+/-7). The two later comparator surveys, with no specific focus on agriculture, may well classify some unpaid farm work elsewhere in the activity coding lexicon, so the real means of paid work time for 1975 and the 2000s may in fact be a little higher than these estimates. Broadly, we see a four-fold increase in market-related work over this period.

The dramatic increase in the means of market work time represents the rapidly increasing proportion of women in paid labour. In what follows, we adopt a minimal definition of paid labour force inclusion of just one hour or more per day. Based on this highly inclusive criterion, 35% of the rural women in our sample had a substantial part-time or full-time job (or substantial unpaid farm work) in the 1920s, 50% in 1975, and 66% in the 2000s (with a further 10% having between four and seven hours weekly paid work). This shift, from slightly more than one third of women in employment to fully two-thirds, has an obvious potential relationship to time devoted to the various sorts of work. Are these simple plots of means of time in activity misleading us about historical processes? Do the historical changes discussed so far disappear once we control for changes in labour force participation?

The influence of labour force participation

The two panels of Figure 2 show the eight work-related activity categories, but now plotted separately for rural women placed, according to our 7 hours per week definition, respectively inside and outside the labour force.

The simple constraint of time availability means that at each of our three points in history, the non-employed women devoted more time to each of the seven categories of unpaid work than their employed counterparts. But aside from the absolute levels, the historical trends for women in the two employment categories are closely similar. We cannot, however, rest the analysis at this point. Both the (falling) capital costs and the (improving) performance characteristics of the various sorts of domestic equipment—and the increased participation of their husbands in household production—mean that otherwise similarly-placed women making decisions about whether or not to take paid work might have made different decisions at the successive time points. And co-incident changes in family size decisions (again partially reflecting changes in reproductive technology) and in public sentiments about gender roles, may have had parallel effects on women’s labour market decisions.

In short, the changing processes of selection between the two employment categories mean that the historical comparisons may still be misleading. We cannot remedy this completely, but we can go some way towards this with the information now available.

Modelling unpaid work time 1925–2011

To control for the influences of these selection processes to the fullest extent possible, we need first to model the influences of the various demographic and other characteristics which influence time-use patterns, and then to reconsider the historical trends, holding those characteristics as far as possible constant by considering various representative instantiations of the models.
Figure 2a
US farm and town married women 1920s to 2000s, six or fewer hours paid or farm work per week.

Figure 2b
US farm and town married women 1920s to 2000s, more than six hours paid or farm work per week.
We use fairly standard Ordinary Least Squares models of the sort used, for example, by Bianchi et al. (2000, 210, Table 2). Our model estimates age and period effects, but has no higher education measure (very few of the rural women reported any). We use more comprehensive information on numbers and ages of children, and more interactions between these characteristics and the survey period, to allow for the possibility of historical changes in the relationship of the effects of particular family statuses (e.g. ages of youngest children) on time in various activities. The $R^2$ statistic of .18 for the ‘all unpaid work’ model is just slightly higher than the equivalent .16 score in the Bianchi et al. (2000) result, reflecting the longer time period covered in our paper.

Table 1 gives an abstract from the full regression results. It shows the crucial historical change and period*employment status coefficients for five sorts of unpaid domestic work, as well as the overall model for all unpaid work. (Note—a pleasing and useful characteristic of OLS—the regression coefficients of the sub-categories sum precisely to the ‘all unpaid’ coefficients). Controlling for virtually all of the heterogeneity that our combined datasets currently allow, we see, from the increasingly negative coefficients for 1975 and 2003-11, that time spent in cooking, other domestic (cleaning and clearing) and clothes care (laundry, sewing and knitting) show monotonic declines, while ‘shopping and household administration’ and ‘care of children and adults’ exhibit monotonic increases. Sum these carefully controlled component coefficients to get the overall historical change stripped of the effects of all the other measured compositional changes, and we find a one hour reduction in all unpaid work from the 1920s to 1975, and a further hour’s reduction from 1975 to the 2000s. Essentially, this is an unchanged headline story from that derived from the historical comparisons of means in the previous two sub-sections.

### TABLE 1 OLS models of minutes per day in rural married women’s unpaid work

|                | cooking | other domestic | clothes care | shop, admin | care of persons | all unpaid |
|----------------|---------|----------------|--------------|-------------|----------------|------------|
| Multiple R     | 0.46    | 0.31           | 0.34         | 0.16        | 0.50           | 0.42       |
| (also controlling for age, age squared, N of children, age youngest child, interactions: see Table A1) |        |                |              |              |                |            |
| economically active | -2.3    | -9.1           | -28.4        | ***         | -10.5          | -54.1 **    |
| economically active 1975 | -29.0   | -33.4 **       | 7.0          | -15.8       | -17.2          | -88.6 ***   |
| economically active 2003-11 | -14.0 * | -27.7 **       | 21.6 ***     | -8.0        | -24.3 *        | -52.5 **    |
| Surveyed in 1975 | -40.7 *** | -44.2 ***      | -65.1 ***    | 69.8 ***    | 24.6 *         | -55.6 **    |
| Surveyed in 2003-11 | -77.3 *** | -74.7 ***      | -83.5 ***    | 76.8 ***    | 36.5 *         | -122.2 ***  |
| (Constant)    | 96.2 *** | 126.3 ***      | 87.5 ***     | 25.7        | -18.7          | 317.1 ***   |

Digging a little deeper, however, the story becomes just a little more complicated. Note the somewhat non-monotonic behaviour of the period*employment interaction coefficients. For example, considered on its own, it might appear that nearly half of the reduction in cooking time for employed women between the 1920s and 1975 was reabsorbed into cooking between 1975 and the 2000s. But of course, in order to understand what is really happening over this period, we need to consider some more comprehensive instantiations of the regression models.
Figure 3a Estimated Cooking and Cleaning Time
US married rural women aged 40

Figure 3b Estimated Child and Adult Care Time
US married rural women aged 40
The left-hand panel of Figure 3 shows a representative set of full instantiations of the cooking and cleaning models. We take in each case women aged 40 (the model specification excludes age*period interactions because of problems of multicollinearity with family status*period interactions). We look separately at economically ‘active’ and ‘inactive’ women (using our one hour per day criterion), and five distinct family situations with (at least by supposition) increasing levels of burden; from women in households with no children, to women in households with three children of whom the youngest is aged below 3 years.

The instantiations produce clear and understandable cross-sectional differences and regular, monotonic historical trends. For each historical period and family status, those women out of the labour market do more cooking and cleaning than those in paid employment. (It appears also that the difference made by employment is much larger in the latest period than in the earliest—but this may reflect a change in the unobserved differences within the categories, of a sort that we discuss below.) We see, at least in the earliest and latest cases, that three older children are associated with more cooking and cleaning than are three younger ones. And we see that, in general, women in smaller households with no children devote the least time to these activities. But most importantly, we see an entirely consistent historical trend; time devoted to these core household activities reduces dramatically overall through the 85-year period and over both the earlier and later historical periods.

The consistent cross-sectional differences and historical trends are also found in the right-hand panel instantiation of the child and adult care trends in Figure 3. Again, point for point, the non-employed women spend more time in care activities than do their employed counterparts, by a margin that increases regularly—both generally over time and in absolutely strict inverse ratio to what (we may presume to be)—the level of burden imposed by the family status. Figure 3, together with Table 2, demonstrate that throughout the 85-year period, non-employed women with the least burdensome family responsibilities spend substantially less time in childcare than non-employed women with the most family responsibilities and show a much larger margin of time in childcare over employed women with equivalent levels of responsibility. By contrast, those non-employed women with the highest levels of family responsibility have the most childcare time and show substantially the smallest margin of difference when compared to equivalently-placed employed women.

The two panels of Figure 3 are representative of the historical trends of the four decreasing unpaid work activity categories (cooking, cleaning, laundry, sewing and utilities respectively) of the left panel of Figure 1 and the three increasing unpaid work activities (childcare, shopping and domestic management) of the right-hand panel of Figure 1. Over historical time, these two opposing patterns of change in time allocation, in effect, race against each other to produce the model-based estimated trends of unpaid work totals for women in the same ten employment and family circumstances, as shown in Figure 4.

Consider first the non-employed women. Having controlled for heterogeneity to the fullest extent possible given our current knowledge of the circumstances of the sample members, all five groups of these women show some reduction in unpaid work time over the 85-year period. Those with no or relatively small family responsibilities show the largest reductions. But the larger the family and, more particularly, the younger the children are, the smaller the historical reduction in unpaid work time. Why?
Figure 4  Estimated Total Unpaid Work Time
US married rural women aged 40

| 1920s | 1975 | 2000s |
|-------|------|-------|
| economically active | not economically active | 1 child aged 3 |
| 3 children youngest 3 |
| 3 children youngest 15 |
| 1 child aged 15 |
| no children |

1 child aged 3
3 children youngest 3
3 children youngest 15
1 child aged 15
no children
TABLE 2 Change in family care time by family status

|                  | 1920s | 1975 | 2000s | 1920s | 1975 | 2000s | 1920s | 1975 | 2000s |
|------------------|-------|------|-------|-------|------|-------|-------|------|-------|
| 1 child aged 3   | 1.14  | 1.27 | 1.22  | 31    | 51   | 48    | 71    | 31   | 51    |
| 1 child aged 15  | 1.37  | 1.71 | 1.42  | 11    | 43   | 28    | 50    | 32   | 30    |
| 3 children youngest 3 | 1.13  | 1.25 | 1.19  | 27    | 71   | 45    | 78    | 27   | 71    |
|                  |       |      |       |       |      |       |       |      |       |

This reflects arithmetically the accelerating historical trend in the marginal effects of family responsibilities as shown in Panel 2 of Table 2 (for example, the 27 minute increase for employed women with three children under three between the 1920s and 1975, becomes a 71 minute increase between 1975 and the 2000s). This acceleration (which corresponds to the increasing gradients in the Figure 3 ‘caring’ plots) is seen in seven of the eight comparisons in this panel—the single exception being the non-employed women with children aged 15.

Behind this arithmetic lies differential selection. Over both of the periods, women in each of the family size and age-of-youngest-child categories became progressively more likely to enter the paid labour force. A mother with three children including (at least) one toddler, was more likely to have at least a part-time job in 1975 than in 1925, and in 2005 than in 1975. To the extent that labour force participation reflects family burdens, we can assume that those women with three children including two toddlers (not controlled for in the model), are less likely to enter the labour force than those with only one.

So this is the selection effect: non-employed women’s family responsibilities within each of the measured categories become more burdensome over time, in ways which are not measured (or at least, not included in the model). And by the same argument, the mean level of family responsibilities becomes heavier for each category of employed women as well, since, for example, some of those women with two toddlers who would not have been in employment in 1975, would be more likely to consider employment in 2005.

Similar considerations apply to each of the categories of non-market work. To the extent that women are still responsible for a larger proportion of unpaid work than their partners, the larger the household or the home, the more dependent children or elders, the more extensive the weekly shop, and so on, the larger the consequences of the ‘unobserved’ historical change effects on the various sorts of women. The consequences of selection are smallest for women with no children (who live, on average, in smaller houses and with smaller numbers of co-residents). So in Figure 4, the women, in and out of paid employment, with no children, show the clearest effects of household automation (since other sources of variation are most effectively controlled-for). Those women with three children, including a toddler, who remain non-employed in the 2000s, have on average much heavier domestic burdens than their 1920s counterparts. A case of unobserved (or at least uncontrolled-for) heterogeneity!

Change in behavioural propensities versus compositional effects

Do the substantial historical trends discussed in this section reflect changes in the makeup of the households (family size, children’s ages, women’s labour-market engagement, etc.) or changes in the behaviour associated with particular household characteristics (effects of new social norms, of the diffusion of new equipment, materials and technical infrastructure)? To answer this question, we
deploy the straightforward Oaxaca Decomposition technique, suggested for just this purpose in Bianchi et al. (2000).

This technique relies on the observation that the sources of historical change in the value of a dependent variable between two time points that are explained by a set of independent variables can be broken down into four components:

historical change in means of time in an activity
  = intercept change effects + coefficient change effects
  + means change effects + interaction change effects

With dependent variables $Y_i^{t}$ time point and $n$ independent variables $X_i^{t}$ in an OLS regression ($\bar{X}_i^t =$ mean of $X_i^t$):

change in means of time in activity= $\bar{Y}_i^{t=1}$-$\bar{Y}_i^{t=0}$
  intercept effects= int$^{t=1}$_i - int$^{t=0}$_i
  coefficient effects= sum$^{t=1}$$_i$($\bar{X}_i^{t=0}$ * ($b_{i1}^{t=1}$ - $b_{i0}^{t=0}$))
  mean effects= sum$^{t=1}$$_i$($b_{i0}^{t=0}$ * ($\bar{X}_i^{t=1}$ - $\bar{X}_i^{t=0}$))
  interaction effects= sum$^{t=1}$$_i$($b_{i1}^{t=1}$ - $b_{i0}^{t=0}$)*($\bar{X}_i^{t=1}$ - $\bar{X}_i^{t=0}$)

...where change is estimated from t=0 to t=1. Intercepts plus coefficients together constitute what Bianchi et al. (2000, 211) call “behavioral propensities” and interaction effects are that part of the overall variance explained as the joint product of coefficient changes and changes in the means of the independent variables.

We base our estimation on a version of the cross-time OLS regressions excerpted in Table 1, but now, in effect, fully saturated with interactions between the historical period and the other independent variable—in the form of separate regressions for each period. These 18 individual regressions are set out in Table A1, while the means of the independent variables, together with an example of the Oaxaca calculations, in Table A2.

**TABLE 3**
Proportion of all historical change in time use related to behavioural propensities

|                      | 1920s-1975 | 1975-2000s | 1920s-2000s |
|----------------------|------------|------------|-------------|
| cooking              | 90%        | 94%        | 95%         |
| other domestic       | 120%       | 83%        | 173%        |
| clothes care         | 96%        | 97%        | 99%         |
| shopping             | 110%       | 129%       | 105%        |
| child & adult care   | 139%       | 111%       | 129%        |

It emerges that the great majority of all the change over this extended period is explained neither by changes in the size and composition of families, nor by women’s increasing levels of commitment to paid work, but straightforwardly by changes in behaviour. We arrive at this interpretation reasonably un-problematically, since in every case less than 10% of all the explained variation in the time use categories is associated with interaction (and hence un-attributable—the fact of generally small positive interaction coefficients meaning that the behavioural proportions are slightly underestimated). In fact, the behavioural proportions in excess of 100% in Table 3 tell us that the compositional effects on their own would (had there been no compensating behavioural shifts) have led to historical trends in the opposite direction to those actually found in the diary evidence.
4. DISCUSSION

What is the nature of these behavioural shifts? In straightforward contradiction of the claims made by Vanek, Cowan, Mokyr, and less directly by Bittman et al., and others, we do not find any convincing evidence of increases in housework time, irrespective of any normative shifts—whether towards higher standards of housing or superficial cleanliness or hygienic practices. On the contrary, the straightforward downwards shift in women’s time devoted to cooking, cleaning, laundry and other housework—first identified in cross-time comparisons of micro-level diary survey data (for the US and the UK) by Gershuny and Robinson (1988), and substantiated over the longer-term for the US by Bianchi et al. (2000, 2012)—now emerges as fully consistent with our much longer-term evidence for the US.

We nevertheless have little doubt (although we present no evidence) that US norms have indeed shifted in the direction proposed by Vanek and her successors. Simply, we infer (although we present no direct evidence) that ‘labour saving’ materials and equipment, together with associated infrastructural improvements, have increased domestic labour productivity at a rate that exceeds the evident growth in the quantity and value of housework-type domestic services (i.e. cooking, cleaning, clothes care, etc.). The outsourcing of various commodities that were previously produced within private households also reduces domestic labour—demonstrated directly by the virtual disappearance of time devoted to dressmaking and repair.

Household work trends in the broader sense, however, tell a quite different story. Childcare time, all are agreed, has grown consistently through this period, which must relate at a general level to changes in norms. We advance two main explanations: ‘positional competition’, encouraging parents to devote ever more time to enhancing aspects of their children’s human capital so as to improve their future earnings and social status; and growing protectiveness with respect to environmental threats, perhaps related to smaller completed family sizes. There may, however, also be a contribution as an indirect consequence of technological change. The previously-mentioned reduction in housework may, in effect, reveal childcare activities that were previously masked as secondary accompaniments to activities described primarily as cooking, cleaning or laundry. Some careful re-analysis of the complete primary plus secondary (where available) activity records in the American Heritage Time Use Study (AHTUS) is called for here.

The increased volume of purchases (more disposable income, less self-provisioning for food and clothing) is part of the explanation for the rising historical trend in shopping. Also, until recently, retailers’ pursued economies of scale and reduced service provision through ever-larger warehouse-type self-service outlets, which in effect exports much of the transport and service work previously associated with sales occupations into the unpaid work—time travelling to and from, and movement and queueing within shops—of domestic consumers.

Will newly emerging internet-based sales and home delivery services reverse the historical trend in shopping time? We must wait on future time-diary data collection to answer this question.
### APPENDIX Table A1  Regression coefficients by period

(* * * p < .0005  ** p < .005  * p < .05

|                   | cooking          | other domestic  |
|-------------------|------------------|-----------------|
|                   | 1928 1975 2003   | 1928 1975 2003  |
| Multiple R        | 0.23 0.32 0.21   | 0.11 0.23 0.20  |
| diarist age       | 0.40 1.84 0.52   | 0.12 0.50 1.23  |
| diarist age squared/100 | -0.55 -1.32 0.02 | 0.23 -0.11 -1.12 |
| n of children in household | 6.44 *** 4.22 * 5.92 *** | 0.34 -4.50 4.34 * |
| no child (def.)   |                  |                 |
| youngest child 0-3| -22.56 *** 19.61 * 5.38 | 2.47 26.74 * 5.74 |
| youngest child 4-7| -9.33 9.69 1.44 | 0.96 37.96 * 15.11 * |
| youngest child 8-11| -5.01 3.51 1.24 | -1.40 17.51 4.18 |
| youngest child 12-17| -2.89 15.19 * 3.25 | -0.86 3.04 8.58 |
| not economically active (def.) | -0.54 -30.70 *** -16.20 *** -8.64 * -42.11 *** -37.00 *** |
| (Constant)        | 114.81 *** 27.67 21.39 * 42.86 *** 88.31 * 48.80 * |

|                  | clothes care | shopping |
|------------------|-------------|---------|
|                  | 1928 1975 2003 | 1928 1975 2003 |
| Multiple R       | 0.26 0.19 0.12 | 0.26 0.16 0.07 |
| diarist age      | -1.20 0.14 1.30 * | 2.47 *** 4.81 * -0.60 |
| diarist age squared/100 | 1.43 0.49 -1.12 | -3.12 *** -6.65 * 0.67 |
| n children in household | 1.97 0.35 2.60 * | -1.07 -2.36 -0.99 |
| no child (def.)  |             |         |
| youngest child 0-3| -13.27 9.51 -4.87 | 0.13 -26.68 * -13.68 |
| youngest child 4-7| -3.45 3.06 -4.44 | 0.98 -19.80 -13.86 |
| youngest child 8-11| 0.74 23.29 * -5.87 | 4.33 -27.48 * -1.22 |
| youngest child 12-17| -4.21 11.58 6.24 * | 8.26 * -12.36 -4.75 |
| not economically active (def.) | -26.39 *** -20.73 *** -7.10 *** -4.92 ** -22.11 ** -10.96 ** |
| (Constant)        | 133.06 *** 29.12 -4.30 | -12.16 35.31 116.45 *** |

|                  | child & adult care | all unpaid work |
|------------------|--------------------|-----------------|
|                  | 1928 1975 2003     | 1928 1975 2003  |
| Multiple R       | 0.59 * 0.47 * 0.49 * | 0.40 0.45 0.38 |
| diarist age      | -2.99 3.44 2.45   | -1.20 10.74 ** 4.90 * |
| diarist age squared/100 | 2.81 -4.14 -2.71 | 0.80 -11.72 *** -4.27 * |
| n children in household | 5.98 ** 2.87 13.57 *** | 13.65 *** 0.58 25.44 *** |
| no child (def.)  |                   |                 |
| youngest child 0-3| 46.44 *** 80.61 *** 119.70 *** | 13.22 109.79 ** 112.27 *** |
| youngest child 4-7| 12.37 33.35 ** 59.29 *** | 1.53 64.26 * 57.54 *** |
| youngest child 8-11| -5.28 26.30 * 27.24 *** | -6.61 43.13 25.56 * |
| youngest child 12-17| -1.15 -4.65 6.04 | -0.84 12.80 19.36 |
| not economically active (def.) | -6.05 -28.10 *** -34.66 *** -46.54 *** -143.75 *** -105.91 *** |
| (Constant)        | 86.05 *** -18.58 3.71 | 464.62 *** 161.83 * 186.04 *** |
Table A2  Oaxaca decomposition of cooking time 1920s-75, 1975-’00s and 1920s to 2000s

| minutes change due to:           | change in minutes/day | percentage change |
|----------------------------------|-----------------------|-------------------|
|                                  | 1928- 1975- 2003     | 1928- 1975- 2003 |
| intercept differences            | -87.1 -6.3 -93.4     |                   |
| coefficient differences          | 46.0 -26.2 17.4      |                   |
| Propensity differences           | -41.2 -32.5 -76.0    | 90% 94% 95%       |
| means differences                | -0.4 -3.0 -1.3       | 1% 9% 2%          |
| interaction differences          | -4.3 1.0 -3.1        | 9% -3% 4%         |
| total change                     | -45.9 -34.4 -80.3    | 100% 100% 100%    |

cooking regression coefficients

| means                      | 1928 1975 2003 | 1928 1975 2003 |
|---------------------------|---------------|---------------|
| Multiple R                | 0.23 0.32 0.21|               |
| diarist age               | 0.40 1.84 0.52| 38.51 40.10 42.18|
| diarist age squared/100   | -0.55 -1.32 0.02| 1625.90 1790.02 1921.79|
| n of children in household| 6.44 4.22 5.92| 1.39 1.28 1.18 |
| no child (def.)           | -22.56 19.61 5.38| 0.23 0.23 0.22 |
| youngest child 0-3        | -9.33 9.69 1.44| 0.18 0.10 0.14 |
| youngest child 4-7        | -5.01 3.51 1.24| 0.12 0.10 0.12 |
| youngest child 8-11       | -2.89 15.19 3.25| 0.13 0.16 0.14 |
| not economically active (def.)| -0.54 -30.70 -16.20| 0.34 0.50 0.65 |
| economically active        | 114.81 27.67 21.39|               |
| (Constant)                |               |               |

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