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Appliances and their impact: the ownership of domestic technology and time spent on household work

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Abstract

Ever since the appearance of Vanek's pioneering article in 1974, there has been a controversy about whether 'labour saving' domestic appliances actually save labour time. Vanek argued that time spent in housework had barely changed since 1926, despite the diffusion of practically every known domestic appliance over this period. Gershuny and Robinson challenge Vanek's 'constancy of housework' thesis, arguing that, between 1965 and 1985, domestic technology has significantly reduced the weekly hours of women's routine housework. Although there is much talking past each other, none of the protagonists in this dispute have any direct data about which households own or do not own domestic appliances. Instead, they all rely on the passage of the years as a proxy for ownership of domestic appliances, since a higher proportion of contemporary households now own domestic appliances. The Australian 1997 Time Use Survey (Australian Bureau of Statistics 1998b) is rare among official surveys, as it simultaneously provides detailed information on time spent in housework and an inventory of household appliances. The analysis of this data show that domestic technology rarely reduces women's unpaid working time and even, paradoxically, produces some increases in domestic labour. The domestic division of labour by gender remains remarkably resistant to technological innovation.

Keywords: Household work; time; technology; women; income

Thirty years ago, in a now classic article in *Scientific American*, Joann Vanek (1974) announced to the world that the time non-employed women devoted to housework in the USA had not declined over the preceding half century.[1] This was a strikingly counterintuitive finding. As Vanek herself argued, there were a number of reasons to expect the obverse, that is, that during the four decades for which she had evidence, time spent in housework by

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non-employed American women would have diminished. Over this period, American families had typically become more urban. In the 1920s rural American families produced over 70 per cent of the food they consumed, whereas urban families produced a mere 2 per cent. Moreover, the birth rate had fallen, taking in lodgers had become a rare practice, fewer family members came home for lunch, and many more women, including married women, were in paid employment.

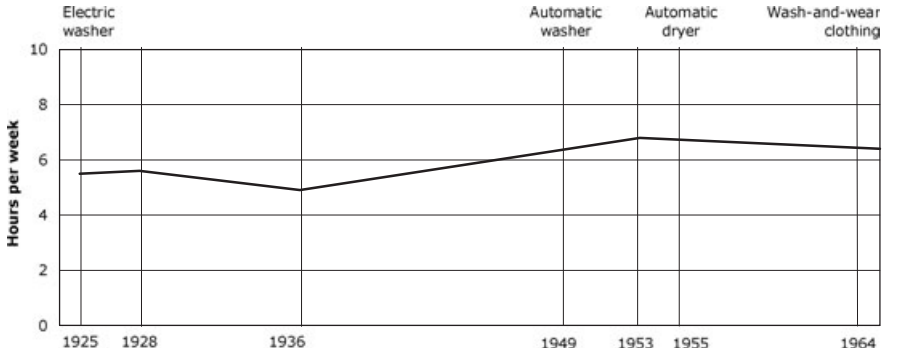
These changes alone might reasonably have been expected to reduce the need to spend long hours in housework. However, from Vanek's point of view, the primary reason for believing that time spent in housework would have diminished between 1926 and 1966 was that American households had been electrified, acquired internal plumbing and an assortment of small machines marketed as 'labour-saving appliances'. In Ruth Schwarz Cowan's (1985) memorable phrase, over these forty years, Americans had witnessed 'an industrial revolution in the home'.

Vanek's conclusion, that housework time for non-employed women had remained relatively constant, rapidly passed into folklore. It was quickly followed by some elaborate attempts to explain the paradox of widely diffused 'labour-saving appliances' that didn't save time. Vanek argued that while aggregate time spent in housework had remained relatively constant, there had been significant redistribution of time among the component tasks, so that while food preparation time had declined, time spent in childcare, shopping and household management had expanded substantially. Others developed these ideas, arguing that rising standards of cleanliness, greater output, fewer servants, the extra transport involved in consuming substitutes and the addition of new tasks had all combined to neutralize any time saving delivered by the new domestic machines (Cowan 1985; Wajcman 1991).

Time spent doing laundry provided the clearest test because, according to Vanek, 'probably no aspect of housework has been lightened so much by technological change as laundry' (1974: 117). Over the period under investigation, American households had acquired running water, specialized soaps and detergents, automatic washing machines and large stocks of clothes made from 'easy care' fabrics. 'Nonetheless', Vanek remarked, 'the amount of time spent doing laundry has increased . . . presumably because "people have more clothes now than they did in the past and they wash them more often" ' (Vanek 1974: 117), a conclusion she supported with the illustration shown in Figure I.

Vanek's ideas have continued to define the debate about the relationship between housework time and technology. However, there are serious methodological shortcomings in her approach. The most significant weakness in Vanek's analysis is how she linked time spent in housework to domestic technology.[2] In fact, Vanek had no direct information on the number and type of domestic appliances owned by any household. Instead, her reasoning depends upon using the passage of the years to stand as a proxy for the progressive

FIGURE I: *Time devoted to laundry*



Source: Vanek 1974: 119.

diffusion of domestic technologies to all American households. Vanek reasons that, as domestic appliances 'sold widely' after a certain date, the aggregate mean time spent in household tasks after that date should reflect this (1974: 119). For example, Figure I shows the time devoted to laundry (on the vertical axis) and a time-line (on the horizontal axis) with markings representing the dates at which various domestic technologies achieved significant sales. Vanek interprets this diagram as an illustration that time spent in laundry has not been diminished by the diffusion of automatic machinery for washing clothes, the diffusion of aids for drying, and the development of easy care fabrics.

In making her claims about the effects of domestic technology on time spent in housework, Vanek's analytic strategy is twofold. Firstly, she screens-out a finite number of potentially confounding factors – changes in employment and urbanization – thereby controlling for compositional change in the American population. Vanek is aware of significant differences between sub-populations in time spent in household work, noting, for example, that 'employed women devote about half as much time to household tasks as non-employed women' (1974: 118). Vanek acknowledges that in recent times 'proportionately fewer women are full-time homemakers' and this alone might be expected to result in a progressive decline in the time devoted to housework (1974: 118).

Secondly, the most crucial element in Vanek's strategy is her assumption that any residual change (or lack of change) over the forty-year period must be the result of the diffusion of domestic technology. However, in addition to the mass adoption of domestic appliances, other important cultural changes were taking place at the same time, for example, public awareness of hygiene increased and there was a new emphasis on parental behaviour during the early years of childhood. Economists have developed the term 'unobserved characteristics' to cover all the factors that might influence social and economic action but are not directly measured in the survey being analysed.

Logically, there is no substitute for being able to combine some direct measure of the time spent in domestic activities with direct observation of the household stocks of domestic technology. This is precisely what this paper provides. Our analysis is based on the only dataset with good information about the ownership of key appliances and accurate measures of the time spent in housework.[3]

Proponents' case for the contrary hypothesis – that domestic technology reduces housework time – suffers from exactly the same methodological problem. After discovering the archived Mass Observation time-diaries for the UK in the 1930s and 1950s, Gershuny felt he had an historical sequence of data to rival that of Vanek. Just as Vanek's conclusion was taken-for-granted for almost thirty years, its rebuttal by Gershuny and Robinson (1988) has now achieved the aura of 'commonsense'. They argue that 'domestic work time has been declining for women', even after controlling for 'structural changes' in 'women's employment and family status' (Gershuny and Robinson 1988: 551). This reduction of routine housework is attributed to three causes – the desire to reduce unsatisfying low status activity, the women's movement generating normative support for reducing women's responsibility for housework and the 'time-saving features of new household appliances' such as the dishwasher and the microwave (Gershuny and Robinson 1988: 539).[4]

Clearly, differences between women are crucial to any discussion about housework time. After analysing the data by social class, Gershuny found a steep decline in the domestic labour time of working-class housewives from 1951 onwards, a period that coincides with the mass consumption of white goods. Gershuny concludes that 'it would seem perverse to refuse to ascribe a substantial part of the reduction [in working class women's hours of domestic work] to the diffusion of domestic technology' (1985: 151).[5] The time use of middle-class housewives, however, follows a more complex pattern. The curve of average time that middle-class housewives spent in housework climbs sharply from 1937 to 1961 before declining almost as fast between 1961 and 1984. According to Gershuny, the steep rise between 1937 and 1961 is due to 'the servant problem', that is, declining availability and use of domestic servants. After 1961, however, middle-class housewives reduced their routine housework in direct parallel with working-class housewives because of the time-savings delivered by new domestic technologies (Gershuny 1985: 150–3).

In disputing Vanek's interpretation of historical trends in time spent in housework, Gershuny[6] and Vanek often seem to be talking past each other. Crucially, Gershuny operates with a more restricted conception of the term 'housework'. When Vanek claimed that time spent in housework had remained constant or, if anything, had increased over a forty-year period, she was making a claim about the time non-employed women devoted to all domestic tasks, including childcare and shopping. Recall, moreover, that Vanek explicitly

suggested that between 1926 and 1966 there had been a re-allocation of the time devoted to the component tasks of housework. Gershuny and Robinson's data suggest that the time women devote to both childcare and shopping has increased over the two decades they studied, while time spent in 'routine domestic work' has decreased over the same period. This finding is consistent with Vanek's interpretation of how time spent in domestic tasks had changed over time, casting a shadow of artificiality over the adversarial nature of the dispute.

Like Vanek, however, Gershuny has no direct evidence about the ownership and use of domestic appliances, as he haltingly acknowledges (Gershuny 1985: 152). As a consequence, he too allows the passage of the years to act as a proxy for the diffusion of domestic technology. In contrast, we argue that it is essential to have a close match between knowledge about the ownership of particular appliances and knowledge about the time spent in the specific task for which they are designed. Only then can we examine whether appliances save labour in a particular task. Fortunately, the Australian Bureau of Statistics included questions about the ownership of household appliances in the 1997 Time Use Survey. This provides a unique opportunity to study whether the presence of domestic technology in the household affects the amount of time women devote to household tasks.

Data source

In 1997, the Australian Bureau of Statistics conducted the second national survey of time use patterns among the Australian population (Australian Bureau of Statistics 1998a, 1998b). The 1997 Time Use Survey was based on a multi-stage area sample of private dwellings. The sample design ensured that within each State and Territory in Australia each person had an equal chance of selection. Because patterns of time use tend to vary with the time of year, the survey was conducted during four collection periods evenly timed throughout the year, one during each season. To ensure that each day of the week was sampled in equal proportion, an equal proportion of respondents were instructed to complete their diaries on designated days. After sample loss, 4,555 households (containing 8,618 persons) were selected for inclusion in the survey.

Information was collected from each selected household by interviewer-administered questionnaires and self-completed diaries. Trained interviewers collected basic information about the household and each of its members aged 15 years or more from a household representative, chosen from amongst the adult members of the household. Diaries were then left for each person aged 15 years or more who were asked to record their activities over two consecutive, specified days. Seventy-three per cent of households and 84 per cent of

persons were classified as 'fully responding' (Australian Bureau of Statistics 1998a: 12–13).

As part of the 1997 Time Use Survey, household representatives were asked about stocks of selected domestic appliances, ownership of motor vehicles and the frequency of consumption of market substitutes for household work associated with food and drink preparation and cleanup, laundry, and grounds care over the previous fortnight.[7] On the basis of this data, we analyse the impact of these technologies on time use patterns through a series of distinct stages. Where possible, the appliances chosen are contemporary and in the process of being adopted by consumers. For the purposes of analysis, it is important to compare behaviour in households that do and do not own a particular appliance. For example, as almost every household possesses a washing machine or stove, no statistically valid comparison between the behaviour of owners and non-owners is possible.

Firstly, we match the technology to time spent in the specific task it is designed for. Microwave ovens, deep freezers and dishwashers are all designed as aids in food preparation and meal clean-up, clothes dryers assist with laundry, and mowers and edge-trimmers are designed to lighten the tasks of grounds care. Food and drink preparation and cleanup, laundry, grounds care, and household work are all groupings of more finely defined activity categories – the 1997 Time Use Survey distinguishes 217 of these refined activity categories. Table A1 in the appendix describes how the activity groupings used in this analysis are built from the more detailed activity codes. Information about men's time spent in these tasks is included primarily because changes in men's share of domestic work might be expected to affect women's time.

Secondly, we investigate the impact these technologies have on women's and men's time spent in household work at a more aggregate level. The value of this procedure is two-fold. It provides a means of detecting some indirect effects of employing domestic technology. For example, if households with a dishwasher entertain more often and as a result become less interested in gardening, we may find that dishwashers reduce the overall burden of housework even though they do not save time in meal preparation and cleanup. Since experience has shown that in analysing time use data the narrower and more infrequent the activity the weaker the statistical reliability, this procedure also provides a rather blunt, but more reliable, measure of the impact of technology.

Method

In this article, a mixture of tobit and ordinary least squares regression models are used to examine the relationship between domestic technology and time spent in household work. These techniques allow us to control for a variety of

variables with the potential to confound the interpretation of the relationship. A substantial proportion of the daily diaries do not report any episodes of food and drink preparation and cleanup. A similar situation obtains in relation to laundry and grounds care. For a significant proportion of the daily diaries, therefore, the amount of time spent in these activities is zero, constituting an observational limit. Ordinary least squares regression, that does not take into account the qualitative difference between a limit and a nonlimit observation, is an inappropriate method for analysing this information. The tobit model, on the other hand, is specifically designed to accommodate the peculiarities of this kind of information (Greene 2000: 905–26). Consequently, tobit models are used to investigate the relationship between domestic technology and time spent in food and drink preparation and cleanup, laundry, and grounds care. As only a tiny proportion of the diaries reported zero observations of the broader aggregate of household work, ordinary least squares regression models are used to investigate the relationship between domestic technology and time spent in household work.

All the models follow the same form. The dependent variables in the tobit models are, as mentioned above, time spent in food and drink preparation and cleanup, time spent in laundry, and time spent in grounds care. The dependent variable in the regression models is time spent in household work. Each of these time use variables is measured in minutes per day.

The models share the same independent variables. Those of primary interest here relate to the domestic appliances mentioned above. Household ownership of a microwave oven, a deep freezer, a dishwasher, a clothes dryer, and a lawn mower or an edge-trimmer are entered into the models as five dichotomous variables (1 = own, 0 = does not own).

The tobit and regression models incorporate a number of other independent variables as controls. These include day of the week, month of the year, whether it was a holiday, geographical location, age, health status, education, ethnicity, household composition, equivalent weekly household income, relative income (designed to capture the extent of economic dependency of one household member on others), type of dwelling, number of vehicles possessed by the household, consumption of restaurant meals, takeaway food, cleaning services, laundry services, gardening or mowing services and use of formal and informal childcare. These controls are more fully described in Table A2 in the appendix.

Domestic technology and time spent on housework

Table I describes the mean amount of time spent by Australian women and men in various kinds of household work. Women are predominantly responsible for 'food and drink preparation and cleanup' and 'laundry', as well

TABLE I: *Mean time spent in various kinds of household work by Australian women and men* (*minutes per day*)

	Women	Men
Food and drink preparation and cleanup	72.3	26.9
Laundry	30.8	4.3
Grounds care	15.3	21.2
Household work	324.2	186.8
N	6,781	6,351

Source: Time Use Survey, Australia, 1997.
Note: In each of these cases, the difference between the women's mean and the men's mean is significant at the 0.01 level.

TABLE II: *Incidence of domestic technologies amongst Australian households*

Technology		N	%
Microwave oven	Household has	5,518	83.1
	Household does not have	1,122	16.9
	Total	6,640	100.0
Deep freezer	Household has	3,528	53.1
	Household does not have	3,112	46.9
	Total	6,640	100.0
Dishwasher	Household has	2,231	33.6
	Household does not have	4,409	66.4
	Total	6,640	100.0
Clothes dryer	Household has	3,798	57.2
	Household does not have	2,842	42.8
	Total	6,640	100.0
Lawn mower or edge-trimmer	Household has	5,053	76.1
	Household does not have	1,587	23.9
	Total	6,640	100.0

Source: Time Use Survey, Australia, 1997.

as 'household work' more generally. 'Grounds care', however, is mostly a male activity.

Table II describes the incidence of microwave ovens, deep freezers, dishwashers, clothes dryers, and lawn mowers and edge-trimmers amongst the Australian population. Of the domestic technologies investigated here, microwave ovens are the most universally distributed, found in over 80 per cent of households. A similar proportion – approximately 75 per cent – of households own a lawn mower or an edge-trimmer. Deep freezers and clothes dryers are less common. Roughly 50 per cent of households have a deep freezer, and a similar proportion own a clothes dryer. Only about 30 per cent of households possess a dishwasher.

The full results of the tobit and ordinary least squares regression models are presented in Table A3 in the appendix. The results on the impact of domestic appliances on time spent in household work are presented in a more summarized form in Table III. For each of the domestic appliances investigated here, the table reports the effect that owning a particular appliance has on the

TABLE III: *The marginal effects of appliances on the time spent in household work by Australian women and men* (*in minutes per day*)

	Microwave oven	Deep freezer	Dishwasher	Clothes dryer	Lawn mower or edge-trimmer
Women					
Food/drink preparation and cleanup†	n.s.	n.s.	n.s.	n.s.	n.s.
Laundry†	n.s.	n.s.	n.s.	3.21**	n.s.
Grounds care†	n.s.	n.s.	n.s.	n.s.	n.s.
Household work	n.s.	n.s.	n.s.	n.s.	n.s.
Men					
Food/drink preparation and cleanup†	n.s.	–2.70**	n.s.	n.s.	n.s.
Laundry†	n.s.	–1.69**	n.s.	n.s.	n.s.
Grounds care†	n.s.	n.s.	n.s.	n.s.	9.33**
Household work	n.s.	n.s.	–9.16*	n.s.	14.69*

Source: Time Use Survey, Australia, 1997.
Notes:
† Based on tobit estimates.
** Significant at the 0.01 level.
* Significant at the 0.05 level.
n.s. Not significant.

amount of time spent in various kinds of household work. The cells in this table show the net marginal effects of various technologies on time spent in household work (measured in minutes per day). In this section, net marginal effects are only shown where the coefficients are significant at the 0.05 level or better. The marginal effects for women that are based on tobit estimates are for women with an average probability of spending a non-zero amount of time in the relevant kind of household work. The marginal effects shown for men follow a similar rule.

Turning to the impact of kitchen appliances first, the data suggests that they do not save women any time. Despite the microwave's capacity to cook food in a fraction of the time needed by conventional stoves, owning a microwave has no significant effect on the time use patterns of women, even when the number of meals out is held constant. Nor does the deep freezer's ability to harvest the economies of scale in meal production significantly reduce the average time that women devote either to meal preparation or to housework overall. It would seem reasonable to expect that a dishwasher, by reducing the time required for meal cleanup, might lower the overall time spent in the kitchen. Contrary to expectations, however, dishwashers appear to have no significant effect on either the time Australian women spend in food or drink preparation and cleanup, or in the daily hours devoted to housework.

Perversely, however, some kitchen appliances seem to diminish the time men spend in food or drink preparation and its associated cleanup, or in housework overall. Although owning a microwave has no significant effect, owning

a deep freezer does significantly decrease the time men spend in food preparation and cleanup by approximately 3 minutes per day. However, these savings in meal preparation time are not passed on to any significant savings in men's overall daily housework time. In a variation on this pattern dishwashers, while not diminishing the time men spend in food or drink preparation and cleanup, reduce the time that men spend in housework overall. (See Table III)

Laundry and grounds care are sex-segregated domestic tasks. Women specialize in laundry (accounting for 88 per cent of all the time spent in this task) while men are the predominant contributors to grounds care (accounting for 57 per cent of the time devoted to this task). The results of this analysis show that, net of other influences, ownership of appliances designed to save labour in laundry and grounds care tends to increase the time allocated to these tasks by those most responsible for them. Women who live in households that have clothes dryers tend to spend approximately 3 minutes more in laundry activities than do similar women who do not have clothes dryers. However, the extra time devoted to laundry does not translate into more time spent in household work overall. Owning a lawnmower or an edge-trimmer increases men's time spent in grounds care and housework generally, even when the type of dwelling (for example, free-standing bungalow versus apartment) is held constant. Men who live in households that have a lawn mower or an edge-trimmer tend to spend approximately 9 minutes longer per day in grounds care and a quarter of an hour longer in housework in general than do similar men whose households do not own these appliances.

It may well be thought that household income explains the ownership of appliances, and that in studying the alleged effects of appliances on time spent in domestic work, we are inadvertently capturing the effect of class. Previous research has shown that high-income households not only own more domestic appliances but also consume more market services that substitute for their own domestic labour (Bittman 2000). As can been seen in Table IV, equivalent weekly household income is significantly associated with small reductions in time spent in unpaid work.

However, a $100 increase in weekly household income is associated with only a very modest (around 2 minutes per day) reduction in the time men or women devote to unpaid housework and childcare. The effects of high income reducing the time spent in separate components of housework, such as cooking, laundry or grounds care, are very small or insignificant.[8] To earn an extra $500 dollars a week and to save perhaps a quarter of an hour a day in housework, suggests something about the utility of domestic labour.

In addition, exchange or bargaining theory suggests that the relative share of resources within households has an important influence on how time will be allocated among household members. These theories predict that the person contributing more financial resources will do less domestic labour.

TABLE IV: *The marginal effects of equivalent weekly household income* (*$100s*) *on the time spent in household work* (*in minutes per day*)

	$100 extra weekly household income‡
Women	
Food/drink preparation and cleanup†	–0.55**
Laundry†	n.s.
Grounds care†	n.s.
Household work	–2.53**
Men	
Food/drink preparation and cleanup†	–0.30**
Laundry†	n.s.
Grounds care†	–0.33**
Household work	–2.23**

Source: Time Use Survey, Australia, 1997.
Notes:
‡ Adjusted for household size.
† Based on tobit estimates.
** Significant at the 0.01 level.
* Significant at the 0.05 level.
n.s. Not significant.

The measure of the respondent's relative income within the household used here is the respondent's weekly personal income expressed as a proportion of the mean weekly personal income of all adults in the household. In the case of a couple who live alone (or with their children) a wife who provides no income will have a relative income score equal to zero, and a wife who provides all the income will have a relative income score equal to two (the mean income of all adults in the household will equal half the wife's income). A wife who provides an equal amount of income as her husband will have a relative income score of one. In the case of a couple who live alone or with their children, this measure of relative income is a linear transformation of the measure of economic dependency described by Sørensen and McLanahan (1987: 663–4). Following the methods used by Brines (1994), a quadratic term is introduced to capture any curvilinear effects.

Table V shows that relative income has a much more powerful effect on time spent in domestic labour than even large increases in total household income. Compared to women who are wholly financially dependent on men, women who earn an equal share of their household's income reduce their time spent in housework by an hour a day. However, little of this overall reduction comes from reducing time spent in cooking, laundry or grounds care. Moreover the relationships between relative income and the above mentioned domestic activities are curvilinear, so that the greatest reductions in a woman's domestic labour come from contributing smaller amounts of income and the effects weaken as a woman becomes the dominant earner in the household.

The impact of relative income on men's domestic labour is also much greater than sharp rises in household income. Compared to men who are wholly financially dependent on women, men who earn an equal share of their

TABLE V: *The marginal effects of relative income within the household on the time spent in household work* (*in minutes per day*)*

	Unit increase in relative income	Unit increase in (relative income-1)^2
Women		
Food/drink preparation and cleanup†	–10.59**	3.91*
Laundry†	n.s.	n.s.
Grounds care†	–2.92**	2.74**
Household work	–47.39**	17.05**
Men		
Food/drink preparation and cleanup†	–4.64**	n.s.
Laundry†	n.s.	n.s.
Grounds care†	n.s.	n.s.
Household work	–19.43**	n.s.

Source: Time Use Survey, Australia, 1997.
Notes:
† Based on tobit estimates.
** Significant at the 0.01 level.
* Significant at the 0.05 level or better.
n.s. Not significant.

household's income are predicted to reduce their time spent in housework by almost twenty minutes a day. In contrast to women, the impact of men's relative income is linear, so that every incremental increase in a man's relative income produces the same rate of reduction in his domestic labour.

Discussion

In this article we have provided unique data that matches the ownership of a particular appliance and the time spent in the specific task for which it was designed. Thus we can, for the first time, directly examine whether domestic appliances actually save labour time in particular tasks. Our overall conclusion is that owning domestic technology rarely reduces unpaid household work. Indeed, in some cases owning appliances marginally increases the time spent on the relevant task. Nor did we find evidence that the diffusion of these appliances leads to any significant alteration in the traditional gender division of housework tasks. In cases where these contemporary domestic technologies do encourage less household work, it tends to be men who are the beneficiaries.

How do we begin to explain these paradoxical effects? Why do devices allegedly designed to save women domestic labour time either fail to save time or increase the time needed in some tasks? Why do these particular appliances appear to serve men rather than women?

Turning to the issue of the failure to save time first, previous commentators have suggested that this could be connected with rising standards in domestic production. The concept of rising standards implies a greater quantity or

quality of domestic production – for example, more or better meals, cleaner clothes and more attractive gardens. In other words, the appliances are used to increase output and not to save labour time. Unfortunately, currently there are no good measures of the output of domestic labour. However, we have presented some indirect evidence to suggest that households behave in this way. We have shown that large differences in household income produce only very small changes in the time devoted to housework, childcare and shopping. This finding is consistent with the idea that higher income households do use their appliances (and paid auxiliary workers) to produce a higher output of goods and services – maintaining larger, more refined and more pleasant homes. Indeed, Gershuny's response to Vanek has produced the explicit suggestion that the middle classes dealt with the historical decline in domestic service by substituting their own labour to produce the domestic goods and services at the culturally required standard.

The most unexpected aspect of our findings is the differences between men and women that emerge in terms of the impact of domestic technologies. None of the appliances we researched reduce women's housework time. Clothes dryers increase the time women spend doing laundry, while microwaves, dishwashers and deep freezers have no significant effect on women's daily hours devoted to housework. Paradoxically, some kitchen appliances, such as dishwashers and deep freezers, lead to reductions in men's housework time. Only a lawn mower or an edge-trimmer increase the time men devote to the traditionally male task of grounds care.

An intriguing aspect of income is the effect of relative income on the time women and men spend doing domestic work. According to either exchange or bargaining theory, the housewife's financial dependence upon the male provider, and not her gender *per se*, is responsible for the traditional sexual division of domestic labour (Bergmann 1986). One would therefore expect that those providing the larger share of household income would spend less time on housework and childcare. This expectation is largely supported by our analysis. Notably, the effect of women's relative income on their time spent in domestic labour follows a complex curvilinear pattern. The bargaining effect of a woman's relative income diminishes as her relative income increases. It is as though women with relatively high incomes need to reassure their husbands by neutralizing the appearance of gender deviance (Bittman, et al. 2003).

Clearly, much more is at stake in marital negotiations than money. The social and cultural construction of gender identity is still heavily implicated in the everyday practices of housework (Butler 1990; Jackson and Scott 2002). To be feminine is to perform femininity, and the daily doing of housework continues to be pivotal to being a wife and mother. Domestic appliances thus enter a domain heavily signified in terms of traditional sex roles. Moreover, these technologies are themselves inscribed with gendered meanings that shape

their design and use. Feminist writing on the social studies of technology suggests that machines arrive in the household already imprinted with gendered agendas defining their appropriate operators (Cockburn and Ormrod 1993; Wajcman 1991; Wajcman 2004). Indeed, individuals demonstrate their gender identity in part through their daily use of technologies.

Not surprisingly, then, our results suggest that the domestic appliances we have investigated tend to reinforce rather than undermine the obdurate sex-segregation of domestic tasks. As women are responsible for over 80 per cent of the time expended in laundry, the purchase of clothes dryers merely increases women's time in laundry. Similarly, work outside the house is heavily masculine, with men typically contributing the majority of time spent in these chores, so ownership of lawn care implements increases men's activity in traditionally masculine outdoor tasks.

Our evidence, then, suggests that domestic appliances are not the solution to saving women time. While it was recently reported (*The Age*, 25 April 2003) that two sportsmen had broken a world record by ironing a Union Jack on Mount Everest, we can only wonder if conquering the mountain of laundry at home would achieve the same acclaim.

(Date accepted: May 2004)

Appendix

TABLE A1: *Classification of activities*

Activity group	Activity code	Activity	Activity code	Activity
Food/drink	410	Food/drink preparation/cleanup (nfd)	Other household work (continued)	
Preparation and cleanup	411	Food preparation	463	Sell/dispose household asset
	412	Preserving/freezing	464	Recycling
	413	Wine/beermaking	465	Mail organization
	414	Set and clear table	466	Pack for journey/moving
	415	Cleanup	467	Packing away goods
	419	Food/drink preparation/cleanup (nec)	468	Disposing of rubbish
Laundry	421	Washing, loading/unload washing machine	469	Household management (nec)
	422	Hanging out/bringing in washing	471	Communication associated with domestic activities
	423	Ironing	481	Travel associated with domestic activities
	424	Sorting, folding clothes	499	Domestic activities (nec)
Grounds care	441	Gardening	500	Childcare activities (nfd)
	442	Lawn care	510	Care of children (nfd)
	444	Cleaning grounds, garage etc	511	Physical care of children
Other household work	131	Personal hygiene	512	Emotional care of children
	171	Communication associated with personal care	521	Teaching/helping/reprimanding child
	251	Job search	541	Minding child
	371	Communication associated with educational activities	551	Visit childcare establishment/school
			571	Communication associated with childcare
	400	Domestic activities (nfd)	581	Travel associated with child care
	420	Laundry/clothes care (nfd)	599	Childcare activities (nec)
	425	Clothes upkeep and care	600	Purchase goods and services (nfd)
	426	Clothes making	610	Purchasing goods (nfd)
	427	Sorting clothes for disposal	611	Purchasing consumer goods
	429	Laundry/clothes care (nec)	612	Purchasing durable goods
	430	Other housework (nfd)		

TABLE A1: *Continued.*

Activity group	Activity code	Activity	Activity code	Activity
	431	Dry housework	619	Purchasing goods (nec)
	432	Wet housework	620	Purchasing services (nfd)
	433	Dry occasional housework	621	Purchasing repair service
	434	Wet occasional housework	622	Purchase administrative services
	439	Other housework (nec)	623	Purchase personal care service
	440	Grounds/animal care (nfd)	625	Purchase childcare service
	443	Harvesting home produce	626	Purchase domestic/garden service
	445	Pool care	629	Purchasing service (nec)
	446	Pet care	671	Communication associated with purchasing goods and services
	449	Grounds/animal care (nec)		
	450	Home maintenance (nfd)	681	Travel associated with purchasing goods and services
	451	Home/equipment repairs		
	452	Design new home/interior design	699	Purchasing goods and services (nec)
	453	Home improvements	861	Negative social activity
	454	Making furniture/household goods		
	455	Making furnishings		
	456	Heat/water/power upkeep		
	457	Car/boat/bike care		
	459	Home maintenance (nec)		
	460	Household management (nfd)		
	461	Paperwork, bills		
	462	Budget, organize roster, make list		

Notes: (nfd) not further defined.
(nec) not elsewhere classified.

TABLE A2: *Controls used in the tobit and ordinary least squares regression analyses*

Control variables	
Day of the week	Monday (Yes = 1, No = 0); Tuesday (Yes = 1, No = 0); Thursday (Yes = 1, No = 0); Friday (Yes = 1, No = 0); Saturday (Yes = 1, No = 0); Sunday (Yes = 1, No = 0); Reference category = Wednesday
A holiday	(Yes = 1, No = 0)
Season	Autumn (Yes = 1, No = 0); Winter (Yes = 1, No = 0); Spring (Yes = 1, No = 0); Reference category = Summer
Ethnicity	First language spoken English, born in Europe (Yes = 1, No = 0); First language spoken English, born in Asia (Yes = 1, No = 0); First language spoken English, born elsewhere (Yes = 1, No = 0); First language spoken language other than English, born in Australia (Yes = 1, No = 0); First language spoken language other than English, born in Europe (Yes = 1, No = 0); First language spoken language other than English, born in Asia (Yes = 1, No = 0); First language spoken language other than English, born elsewhere (Yes = 1, No = 0); Reference category = First language spoken English, born in Australia
Region	Rural (Yes = 1, No = 0); Other urban (Yes = 1, No = 0); Reference category = Major urban
Age	In ten-year units (e.g. a 42 year old is given a value of 4.2)
$(\text{Age-4.2})^2$	The square of the respondent's age after the mean age of all respondents (4.2) has been subtracted
Sick or injured	(Yes = 1, No = 0)
Disability status	Respondent has a disability but has no moderate to profound limitation in personal activity (Yes = 1, No = 0); Respondent has a moderate limitation in personal activity (Yes = 1, No = 0); Respondent has a severe or profound limitation in personal activity (Yes = 1, No = 0): Reference category = No reported disability; Other adult in household is less disabled than respondent (Yes = 1, No = 0); Other adult in household is more disabled than respondent (Yes = 1, No = 0)
Education	Left school year 12 (Yes = 1, No = 0); Basic vocational post-school qualification (Yes = 1, No = 0); Skilled vocational post-school qualification (Yes = 1, No = 0); Associate diploma (Yes = 1, No = 0); Undergraduate diploma (Yes = 1, No = 0); Bachelor degree (Yes = 1, No = 0); Postgraduate diploma (Yes = 1, No = 0); Higher degree (Yes = 1, No = 0); Other post-school qualification (Yes = 1, No = 0); Reference category = Did not complete year 12
Income	Equivalent* weekly household income in units of $100
Relative income	Respondent's weekly personal income expressed as a proportion of the mean weekly personal income of all adults in the household**
Marital status	*De facto* (Yes = 1, No = 0); Separated (Yes = 1, No = 0); Divorced (Yes = 1, No = 0); Widowed (Yes = 1, No = 0); Never married (Yes = 1, No = 0); Reference category = Married
Household composition	One adult, no children present (Yes = 1, No = 0); Two adults, no children present (Yes = 1, No = 0); Four or more adults, no children present (Yes = 1, No = 0): One adult, children present (Yes = 1, No = 0); Two adults, children present (Yes = 1, No = 0); Three adults, children present (Yes = 1, No = 0); Four or more adults, children present (Yes = 1, No = 0); Reference category = Three adults, no children present

TABLE A2: *Continued.*

Control variables	
Age of youngest child	0 to 1 year (Yes = 1, No = 0); 2 to 4 years (Yes = 1, No = 0); 5 to 9 years (Yes = 1, No = 0); 10 to 12 years (Yes = 1, No = 0); 13 to 14 years (Yes = 1, No = 0); Reference category = No child present
Child, disability status	Household contains a child with a disability who does not have a severe or profound limitation in personal activity (Yes = 1, N = 0); Household contains a child with a disability who has a severe or profound limitation in personal activity (Yes = 1, N = 0); Reference category = Household does not contain a child with a disability
Sex composition of household	Respondent has no female, adult housemates (Yes = 1, No = 0); Respondent has no male, adult housemates (Yes = 1, No = 0)
Type of dwelling	Attached dwelling, including semi-detached, row, terrace, and town houses, as well as flats attached to houses and houses and flats attached to shops and offices (Yes = 1, No = 0); Other dwelling, including flats, units, apartments, caravans, tents, and cabins (Yes = 1, No = 0); Reference category = Separate house
Domestic services outsourced and other domestic technology	Number of times in the previous fortnight the household purchased a meal at a restaurant; or consumed takeaway food; Whether, over the previous fortnight, the household used a dry cleaning, ironing, or laundry service (Yes = 1, No = 0): a gardener or lawn mowing service (Yes = 1, No = 0): or a cleaner or housework help (Yes = 1, No = 0): whether the household usually uses formal childcare (Yes = 1, No = 0); or informal childcare (Yes = 1, No = 0): The number of vehicles possessed by the household

Notes:
*The equivalence scale used here is the OECD equivalence scale (OECD 1982: 36–7). In the analyses here, the OECD equivalence scale has been divided by 2.4 in order to give a household with three adults and no children an equivalized household income equal to its unequivalized household income.
**A quadratic term is also included, which equals the square of the respondent's relative income after the mean relative income of all respondents (1.0) has been subtracted.

TABLE A3: *Multivariate models of Australian women's and men's time spent in domestic activities*

	Women				Men			
	Tobit			OLS Regression Household work	Tobit			OLS Regression Household work
	Food/drink preparation and cleanup	Laundry	Grounds care		Food/drink preparation and cleanup	Laundry	Grounds care	
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	34.20***	–24.16*	–199.37***	243.09***	–7.41	–85.33***	–211.67***	91.65***
Monday	3.16	9.23*	9.73	7.54	–1.65	1.83	–0.17	0.03
Tuesday	–0.46	3.34	5.23	–8.15	–1.21	4.43	8.17	–6.82
Thursday	–2.64	–4.98	–8.59	8.42	–6.34*	–1.76	–25.33**	–2.80
Friday	–5.59	1.48	1.76	0.60	–5.28	–4.24	–18.36	–17.06*
Saturday	–4.19	5.18	29.65***	26.44***	2.45	8.85	18.95	49.61***
Sunday	2.03	5.76	26.82***	–8.19	4.84	10.23	46.69***	44.89***
Holiday	5.00	4.58	23.98***	30.84***	15.10***	–0.26	57.06***	76.42***
April or May	2.52	–1.98	–7.59	–5.66	–1.24	–2.31	–28.56***	–14.83**
June or July	3.61	–4.10	–49.57***	–7.85	2.64	2.09	–67.26***	–15.35**
October or November	–0.37	–3.74	–1.26	–0.18	0.57	3.54	–12.88	–8.87
First language spoken English, born in Europe	–1.80	–1.58	–4.57	5.38	2.48	–8.72	7.34	7.49
First language spoken English, born in Asia	7.35	–13.67	–21.27	–4.50	0.81	3.56	–10.60	–7.99
First language spoken English, born elsewhere	–2.79	–11.04	–7.91	–21.82	0.34	–2.26	17.89	16.93
First language spoken not English, born in Australia	6.18	–12.65	–5.29	8.86	–13.86**	–3.20	25.04	5.30
First language spoken not English, born in Europe	16.12***	–12.59**	–0.67	–7.61	–15.36***	–22.29***	30.81***	–10.40
First language spoken not English, born in Asia	12.76***	–24.72***	2.58	–1.25	–7.54	–14.60	–5.52	19.39
First language spoken not English, born elsewhere	20.80***	–18.81*	–38.33*	16.41	–21.11***	–16.85	–3.36	11.70
Other urban	4.34*	9.37***	13.41**	4.06	2.04	2.86	6.63	–7.35
Rural	6.00*	0.16	26.35***	24.47***	–1.68	1.12	1.74	2.87
Age	15.47***	11.45***	25.27***	33.02***	7.39***	3.43*	33.03***	27.68***
$(\text{Age} - 4.2)^2$	–2.49***	–4.49***	–4.35***	–10.11***	0.05	–2.05***	–1.13	–1.58
Sick or injured	–29.07***	–21.96***	2.66	–58.00***	6.90	–20.02	–61.03***	3.60
Has a disability, no moderate profound limitation	8.26***	–0.86	3.84	19.20**	4.58	2.92	3.39	12.74

TABLE A3: *Continued.*

	Women				Men			
	Tobit			OLS Regression Household work	Tobit			OLS Regression Household work
	Food/drink preparation and cleanup	Laundry	Grounds care		Food/drink preparation and cleanup	Laundry	Grounds care	
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Has a disability, moderate limitation	11.86*	–5.85	6.20	23.98	13.31*	4.98	9.38	39.64***
Has a disability, severe or profound limitation	–6.27	–4.98	–26.25*	–27.15	–1.61	11.80	–25.15	4.29
Adult housemate who is less disabled than the respondent	–11.54***	5.44	1.51	–17.21	–2.84	–7.84	–18.13	–6.67
Adult housemate who is more disabled than the respondent	1.47	–0.35	10.24*	6.51	9.30***	12.16**	–14.35	19.04***
Left school year 12	3.54	–1.25	12.13*	13.67**	7.22**	14.23***	–0.37	12.19
Basic vocational	5.66	4.64	–13.74	19.39*	8.78	19.10*	–8.21	9.90
Skilled vocational	–1.65	–1.61	–12.70	3.67	7.15***	6.12	–4.98	18.42***
Associate diploma	0.89	–4.75	0.62	–2.30	9.61**	11.65	–0.35	13.89
Undergraduate diploma	–5.86	–10.38*	3.05	–10.30	4.84	23.26**	–22.63	23.71*
Bachelor degree	–0.41	–5.14	–5.05	2.20	14.99***	34.34***	–5.20	26.22***
Postgraduate diploma	–9.62	–12.85	15.90	–21.70	16.55**	24.50*	–13.58	30.89*
Higher degree	9.61	6.33	9.27	33.38	11.97*	13.34	–12.52	26.32
Other post-school qualification	16.97***	1.85	–14.62	19.54	5.93	19.12	–29.35	25.66
Equivalent weekly household income (in $100s)	–0.65***	–0.33	0.00	–2.53***	–0.49***	0.37	–1.41**	–2.23***
Relative income	–12.31***	–2.72	–12.30***	–47.39***	–7.68***	–4.82	–0.76	–19.43***
(Relative income – 1)^2	4.54*	1.32	11.54***	17.05***	–1.51	–4.30	–9.43	0.85
De facto	–6.12	–8.68	5.98	–26.53**	0.09	5.06	9.79	18.25*
Separated	–22.34***	–19.30**	–10.17	–45.05***	2.22	14.54	–71.04**	–4.99
Divorced	–30.13***	–27.05***	–10.27	–65.68***	–13.52**	11.57	–66.36***	–22.83
Widowed	–27.57***	–19.50***	2.19	–24.04*	–5.27	32.86***	–39.76*	–10.69
Never married	–23.74***	–32.26***	–22.01*	–63.79***	–11.80***	1.12	–39.78***	–14.88
One adult, no children	–15.23	–27.71**	51.80**	–13.56	–12.83	–0.29	13.36	9.78
Two adults, no children	0.24	–15.34***	20.59*	–11.17	–3.31	–5.40	0.47	12.38
Four or more adults, no children	3.63	–6.20	11.68	6.01	6.29	10.30	–31.47*	2.24

One adult, children	29.46*	7.25	56.74*	297.98***	–6.39	–45.36	–21.84	63.62
Two adults, children	20.49***	3.95	4.29	252.33***	13.55*	14.77	7.94	76.71***
Three adults, children	15.53*	4.68	16.40	223.89***	10.66	14.65	3.96	54.34***
Four or more adults, children	19.88*	6.07	–6.53	213.96***	4.64	15.16	–39.49	41.14*
Youngest child aged 0 to 1 year	16.69*	9.03	15.13	–61.72***	–3.16	–2.40	8.03	–11.80
Youngest child aged 2 to 4 years	12.78*	5.24	19.13	–103.74***	–7.55	–9.98	–15.35	–40.30***
Youngest child aged 5 to 9 years	1.62	2.61	3.43	–157.16***	–4.02	0.84	–9.75	–38.16***
Youngest child aged 10 to 12 years	–7.47	–5.47	0.08	–212.72***	–2.28	9.43	–5.53	–48.93***
Youngest child aged 13 to 14 years	–7.67	7.24	0.83	–207.78***	–11.66	–17.73	–4.17	–49.56***
Child with a disability, no severe or profound limitation	6.75	6.03	7.67	28.66**	–9.49*	–21.85*	3.02	–24.50*
Child with a disability, severe or profound limitation	8.90	–5.28	–13.91	33.26	–5.55	5.41	–1.34	24.96
No female, adult housemates	8.60*	11.18*	7.79	15.58	35.34***	30.36***	24.53	41.00***
No male, adult housemates	2.58	16.77*	20.50	26.97*	7.96*	–2.77	–0.61	–1.57
Attached dwelling	–5.06	–4.57	–21.31*	–20.41*	0.81	–6.10	–17.49	–14.84
Other dwelling	–4.09	–0.95	–60.04***	–18.76*	1.65	–4.03	–93.94***	–26.56***
Microwave	–1.82	2.09	–9.95	–10.75	–3.05	4.06	2.81	–8.93
Deep freezer	–2.81	–3.83	0.89	–0.42	–4.47**	–13.28***	–9.52	–0.47
Dishwasher	–0.07	–1.18	8.52	4.84	–1.86	–6.25	–5.39	–9.16*
Number of times had a meal at a restaurant	–0.54	0.09	–0.10	–0.71	0.18	–0.23	–4.07***	0.08
Number of times had takeaway food	–1.10***	–0.07	–1.07	–1.17	–0.36	0.07	–0.81	–0.31
Clothes dryer	–0.77	6.11**	–1.80	2.47	–1.33	–1.13	–3.40	–2.22
Dry cleaning, ironing, or laundry service	–6.08*	2.12	–8.04	2.46	–2.41	2.34	10.29	3.91
Lawn mower or edge-trimmer	–3.61	–0.22	6.06	3.10	–1.92	–0.63	40.48***	14.69*
Gardener or lawn mowing service	–1.67	1.34	–5.61	0.71	–3.91	–7.88	–25.55**	–18.48**
Number of vehicles	–4.65***	0.62	1.96	1.09	–3.20**	–8.64***	0.53	–6.74*
Cleaner or housework help	–6.01	–9.89*	0.15	–18.45*	1.05	7.85	–11.65	4.71
Formal child care	–5.88	0.48	4.62	–13.32	–1.36	10.80	–3.38	–8.56
Informal child care	–6.12	–4.54	–12.89	–30.39***	2.09	–3.17	–16.15	7.21
Log likelihood/Adjusted R^2	–28347.68	–18951.39	–9832.96	0.32	–19036.10	–4998.31	–9218.08	0.18
Non censored N	4964	3030	1372	5811	3243	684	1238	5413
N	5772	5772	5772	5811	5370	5370	5370	5413

Source: Time Use Survey, Australia, 1997.
Notes: ***P < 0.005, **P < 0.01, *P < 0.05.

Notes

1. In writing her doctoral dissertation, Vanek stumbled upon a collection of time use studies, chiefly conducted in rural localities, by the U.S. Bureau of Home Economics. Together with national data from the 1965/66 United States Time Use Survey, conducted by John P. Robinson and Philip E. Converse, these studies furnished data covering a time-span of nearly half a century.

2. Vanek has been criticized for basing her conclusions on samples of rural households in different localities. Vanek responds to this criticism in a variety of ways, noting that the strict separation of 'farm work' from 'housework' means that over the years like is being compared to like, the similarity of results in the different localities suggests that they conform to a national pattern, and that an urban/rural breakdown of the data she assembled for her study, including data drawn from the single national survey, show that 'rural homemakers spend no more time in household work than urban ones' (Vanek 1974: 116). Vanek speculates that *if* there were some difference between rural and urban households, which she had not yet discovered, then one might expect that women in the technologically deprived rural households spent more time in domestic labour than their urban counterparts.

3. The only exception is Finland, which in some time use surveys has collected some scattered information about ownership of appliances.

4. Gershuny and Robinson's endorsement of the time-saving characteristics of domestic technology is more muted than might be expected from Gershuny's publications.

5. Gershuny expresses a changed view in his most recent book (Gershuny 2000) which is similarly framed as a rebuttal of the standard interpretation of Vanek's views.

6. This same comment also applies to Gershuny and Robinson (1988).

7. Information was sought on the number of times the household had had a meal at a restaurant, had takeaway food, whether the household had used a dry cleaning, ironing, or laundry service, and whether the household had used a gardener or a lawn mowing service. In addition, household representatives were asked whether their households had used a cleaner or housework help and whether their households usually used formal and informal childcare.

8. A $100 rise in weekly household income is significantly associated with a less than 1 minute per day fall in the time women spent in cooking. This is the only statistically significant association between household income and the components of women's domestic labour.

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