Understanding The Second Shift: Have Technological Advances Reduced Chore-Time? Evidence From Colombia

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Abstract

Around the globe, women tend to shoulder a disproportionate burden of unpaid domestic work, commonly referred to as the 'second shift,' on top of their paid work and other responsibilities. This paper aims to investigate the impact of technological advancements on the gendered division of household labor in Colombia. Drawing on data from the 2020-2021 Colombian Time Use Survey, I analyze the extent to which time-saving technologies, such as washing machines, vacuum cleaners, and dishwashers, have reduced the amount of time women spend on household tasks. I find that while these technologies have become more prevalent, they have not significantly reduced women's domestic burden, as noticed by comparing households who own these technologies against those who don't. Furthermore, the use of time-saving technologies is not uniform across different socio-demographic groups, with women who are employed, are more educated, and have higher household income more likely to use these technologies than their counterparts. I also find that the distribution of household labor varies significantly across generations, following an inverted U-shaped curve, with younger and older women generally spending less time on domestic labor compared to women in middle age groups. This finding suggests that the gendered division of labor in the household is influenced not only by technological advancements, but also by cultural norms and gender roles that vary across generations. Policies and interventions that address the underlying causes of gender inequalities in the division of labor are needed to achieve a more equitable distribution of domestic labor and promote greater gender equality.

Keywords: distribution of domestic labor, care work, technology, gender roles, gender equality

JEL Codes: J22, J16, O14

Introduction

In her seminal work "The Second Shift: Working Parents and the Revolution", Arlie Hochschild (1989) unveiled the laborious hours that women, particularly those balancing work and family life, invest in unpaid domestic work, a phenomenon that she aptly termed the 'second shift.' Since then, there has been an outpour of literature concerning the gender disparities in the distribution of household labor, underscoring a global pattern wherein women disproportionately bear the burden of unpaid work, even as they forge ahead in professional spheres. Existing research has focused on various dimensions of this issue, including the socio-cultural factors

influencing the division of labor in the household and the psychological ramifications of a disproportionate workload on women. For example, Carmichael et al. (2022) found that spending more time on unpaid household chores during adolescence tends to increase the likelihood of participating in the workforce later in life; however, high burdens of unpaid housework also have a detrimental effect, leading to poorer job quality and lower hourly wages in the future, especially for women. Similarly, MacDonald et al. (2008) demonstrate that women who spend more time engaged in unpaid work generally experience higher levels of stress compared to men. Anxo et al. (2011) highlight the significant gender differences in time usage at every stage of life, as well as the crucial role the formulation of family policies and employment structures play in molding gender roles distinctly in various institutional contexts.

The rise of household appliances and digital technology in the late 20th and early 21st century promised to alleviate some of the burdens of domestic chores, theoretically allowing for more equitable distribution of household labor. However, contrary to these anticipations, the research surrounding the uptake of these technologies has been mixed. In “More Work for Mother”, Schwartz Cowan (1985) detailed how these innovations, rather than reducing the amount of labor required, often had the effect of increasing expectations for cleanliness and home maintenance, leading to a paradox where modern conveniences did not actually lessen the workload but reshaped it into a more complex form. More recent work, including studies by Bittman et al. (2004), have illuminated the persistence of this dynamic, pointing out that while household appliances and gadgets have undoubtedly brought about convenience and efficiency, they have not fundamentally altered the uneven distribution of domestic labor.

In this paper, I aim to examine the extent to which technological advancements have influenced the distribution of household labor, specifically focusing on Colombia. By analyzing

data from the 2020-2021 Colombian Time Use Survey, I expect to understand whether these advancements have facilitated a more equal sharing of domestic responsibilities between genders or have perpetuated existing disparities. To delineate a comprehensive view, I will further investigate how socio-demographic factors, such as age, education level, and economic status, intersect with technology use in influencing the distribution of domestic work. Additionally, I will explore generational differences in the appropriation of these technological aids, scrutinizing how older and younger generations approach household chores in the presence of these advancements.

This paper aims to contribute to the literature in several dimensions: 1) by presenting a focused analysis of the Colombian context using recent data to shed light on the current dynamics of household labor distribution in the region; 2) by offering a nuanced understanding of how different socio-demographic factors, including education level and economic status, interact with the adoption and usage of modern technologies in the realm of domestic work; 3) by examining generational differences, understanding not just the stark contrasts but the subtle nuances in how different generations approach domestic work with the aid of technology; 4) by integrating a detailed analysis of the role of technology, understanding it not as a standalone factor but as an entity deeply interwoven with societal norms, economic structures, and individual behaviors, thereby providing a deeper understanding of its role in shaping the distribution of domestic labor.

Literature Review

The literature on household technology and housework has been extensively scrutinized within the disciplines of sociology and women's studies. Nevertheless, this subject has received comparatively limited attention within the field of economics. While the economics profession

has come a long way since Becker's analysis of the family as an economic unit whose decisions are governed by rational choice theory, the ensuing literature has largely sidestepped the specific issue of how technological advancements affect the gendered division of domestic labor (Becker, 1965; Becker, 1973). Current feminist economics literature on the burden of unpaid domestic work has focused on the gendered nature of time poverty, the gendered distribution of housework based on couples' earnings and women's shares of total earnings, and the limitations of national accounting and GDP in measuring the value of unpaid labor (Gammage, 2010; Bardasi & Wodon, 2010; Gupta & Ash, 2008; Smith & Ingham, 2005). However, these analyses often do not fully integrate the impact of technological advancements on the division of domestic labor, thereby leaving a critical gap in the literature.

From a sociological perspective, the verdict on whether technology has alleviated women's domestic burden remains inconclusive. Bose et al. (1984) determined that although market services and devices have somewhat streamlined certain aspects of housework, their secondary effects have simultaneously introduced new and additional forms of domestic labor. Moreover, none of these technologies enhanced the enjoyment of housework or contributed to an improved sense of self-worth for women engaged in these tasks. The authors also observed that while the incorporation of these technologies did result in some timesaving, the benefits were counterbalanced by supplementary activities and the maintenance requirements of the new technological systems. To make matters more complicated, some authors have argued that household appliances do not actually reduce the time spent on house chores. Robinson & Milkie (1997) found that those who have washing machines in their homes spend almost double the amount of time on laundry compared to those without. Similarly, Hardyment (1988) argued that the proliferation of household technologies rather than alleviating the burden of women's

housework, reinforced the endless nature of their tasks and made it very difficult for women to combine an ambition to work outside the home with a feeling of satisfaction in one's role as a good homemaker. Cowan (1976) points at another issue: the elimination and ease of modern technologies has drastically altered the nature of domestic work, which has in turn altered the family dynamics. Before the advent of these technologies, families were the basic social unit of interaction and was self-sustaining in nature with women occupying most of their time engaging in housework and care work. However, the spread of these technologies loosened the social cohesion of families and the type of social functions performed by homemakers lost part of its value, which in turn has had an impact on the perception of women's roles within the household and society at large. The automation and deskilling of domestic tasks through technology not only diminished the perceived value of housework but also changed the expectations surrounding women's roles as caregivers and homemakers.

On the other hand, some research has pointed the benefits of technology in partially alleviating the domestic workload. Tewari et al. (2021) found that policy-induced household technology adoption significantly increased child health, by reducing the amount of time mothers spent on domestic chores, allowing them more time for childcare activities such as immunizations and regular health check-ups. However, rather than seeing a reduction in total time spent on house-related tasks, the efforts were often redirected towards other types of housework or caregiving activities, implicitly supporting literature on time-transfer (Vanek,1974; Ramey, 2009). Gershuny et al. (2016) argued that technological advances in the home have increased domestic labor productivity and reduced time spent on traditional housework tasks, even after controlling for normative shifts including higher standards of housing, superficial cleanliness, and hygienic practices. Greenwood (2019) posited that the automation of household

chores through advanced technologies has not only optimized the use of time but also contributed to increasing women's participation in the labor market.

The extent to which technology has reduced the burden of housework is, however, nonlinear. Previous studies have highlighted the influence socio-demographic factors including income, education, and employment status, have on the adoption and utilization of household technologies. Additionally, these factors may contribute to a disparate impact of technology on domestic labor across different groups. For example, Heisig (2011) demonstrated that while economic development narrows the gap in time spent on housework between affluent and impoverished women, this disparity widens in conditions of increased economic inequality, as evidenced by data from 33 countries. Cash et al. (2005) concurred with these findings and observed that the impact of poverty on the amount of housework done by men remained constant, irrespective of economic conditions, hinting at socioeconomic factors may have a differential influence on men's and women's domestic labor responsibilities. This dynamic is further complicated by existing research indicating that women who out-earn their male partners may increase their share of domestic labor to compensate for transgressing traditional "male breadwinner" norms (Baxter and Hewitt, 2013; West & Zimmerman, 1987). Additionally, the presence of men in a household is associated with an increase in the time women spend on domestic work, whereas men tend to reduce their domestic labor when living with women, as noted by Wyatt et al. (1985).

In the Global South, the dynamics surrounding household technology and domestic labor are further influenced by additional contextual factors such as infrastructure, access to utilities, and social norms. Cabeza et al. (2018) used data from 12 countries representing four continents to ascertain the penetration and ownership trends of appliance ownership; their findings revealed

that while the ownership of "white goods" like refrigerators, freezers, and washing machines has shown stagnation in developing countries, "brown goods" such as televisions, radios, and other small line appliances have seen increased ownership rates and have not fully penetrated the market. Additionally, one key factor distinguishing housework in the Global North from the Global South is the increased prevalence of domestic help, such as maids, in the latter. In many countries of the Global South, hiring domestic help for tasks like cleaning, cooking, and childcare is both culturally and economically more accepted. This is largely due to lower labor costs and social structures where employing domestic help is normalized. In the Global North, by contrast, these chores are generally carried out by family members or through commercial services, as live-in domestic help is less common and often financially unfeasible for the average household. Silva (2010) argues that the presence of a subordinate domestic worker often deflects tensions around gender divisions of labor within the family, influencing the relationships between men and women. This shift also impacts the adoption of technological innovations meant to facilitate housework. In the households she studied, such technological advances were often reserved exclusively for the use of family members, rather than being made accessible to domestic workers.

In the context of Colombia, studies have specifically focused on the unequal division of unpaid domestic work and how it is influenced by various factors, including educational attainment and societal norms. Tovar & Urdinola (2019) shed light on the interplay between education and domestic labor, revealing that women with the lowest educational attainment at age 20 spend three times as much time on unpaid housework compared to their more educated counterparts. This suggests that educational opportunities may be a critical factor in reducing the burden of unpaid domestic labor for women, possibly by opening doors to formal employment

that can challenge traditional gender roles. Adding a comparative perspective, Amarante et al. (2023) studied the patterns of unpaid household work across four Latin American countries—Colombia, Mexico, Peru, and Uruguay. Their findings highlight that traditional gender roles and the existing welfare architecture are significant elements that contribute to how unpaid work is divided between men and women. Intriguingly, among the countries studied, Colombia exhibited the widest gap in this regard: women devote 4.3 more hours to unpaid work than men.

Methodological Approach and Sample Characteristics

This paper uses data from the 2020 and 2021 Encuesta Nacional de Uso del Tiempo (ENUT) — National Time Use Survey administered by Colombia's National Administrative Department of Statistics, commonly referred to as DANE. These surveys were executed through face-to-face interviews where respondents filled out electronic forms, providing insights into the designated households chosen for this statistical research. The initial survey garnered participation from 147,579 individuals located in five regions of the country. Ten modules were employed in the survey to capture a wide range of information regarding the time use patterns of the respondents. These modules delved into various aspects of daily life including, but not limited to, work activities, educational endeavors, recreational activities, and domestic chores.

For the purposes of this paper, I focused on modules C1, C2, C3, C7 and C8: C1 gathered data on home spaces, including housing type and public service access; C2 detailed household features such as housing tenure, subsidy receipts, and garbage disposal methods; C3 identified household members and their relationships, including marital status; C7 explored the characteristics and employment details of the working age population; and C8 analyzed time spent on unpaid work and personal activities.

Sample and Descriptive Statistics

After cleaning and preparing the data, 72,579 individual responses from 47,168 households remained. The individuals of interest for the sample were those aged 18-80 who identified as heads of the household and who had the ability to perform household chores. Specifically, this meant excluding individuals with physical or cognitive limitations that prevented them from participating in regular household activities. From this sample, 40,508 (55.81%) were women and 32,071 (44.19%) were men. Table 1 presents data on the summary statistics, including age, educational attainment, earnings, hours worked, and minutes per day worked on different housekeeping activities.

Table 1: Summary Statistics by Gender

	Gender	
	Male	Female
Age	47.94 (14.68)	46.77 (15.02)
Education Level	4.89 (2.75)	4.99 (2.72)
Earnings (COP per Month)	1,449,930 (2,065,495)	1,461,756 (2,228,873)
Hours Worked Per Week	47.99 (16.11)	41.87 (17.34)
Food Related Activities (min/day)	24.65 (47.50)	126.03 (79.18)
Clothing Related Activities (min/day)	5.15 (19.83)	34.98 (53.60)
Cleaning Related Activities (min/day)	24.76 (46.18)	69.75 (66.64)
Building Repair Related Activities (min/day)	6.03 (34.86)	0.37 (8.85)

There are significant differences between the time men and women allocated to various activities, reinforcing trends observed in the existing literature. While both men and women had similar average ages, around 47 and 46 years respectively, the standard deviation suggests slightly more variability in the ages of women. In terms of education, both genders had almost the same level of education, around 4.9, indicating that the highest level attained was generally high school. When it comes to earnings, women, on average, earned slightly more than men.

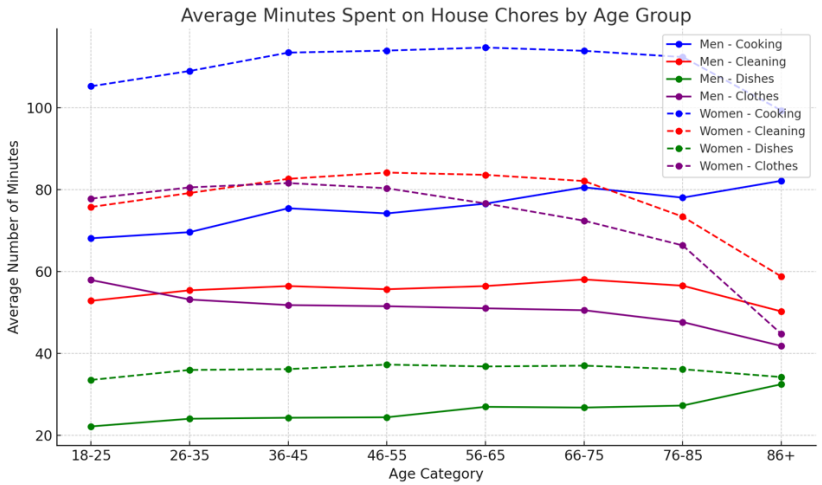
However, the standard deviation for women was higher, indicating more variability in earnings. In the context of work, men worked significantly more hours on average compared to women, and the standard deviation was also slightly lower for men, suggesting less variability in work hours. Women spent significantly more time on food-related, clothing-related, and cleaning activities, while men spent more time on building and repair-related activities.

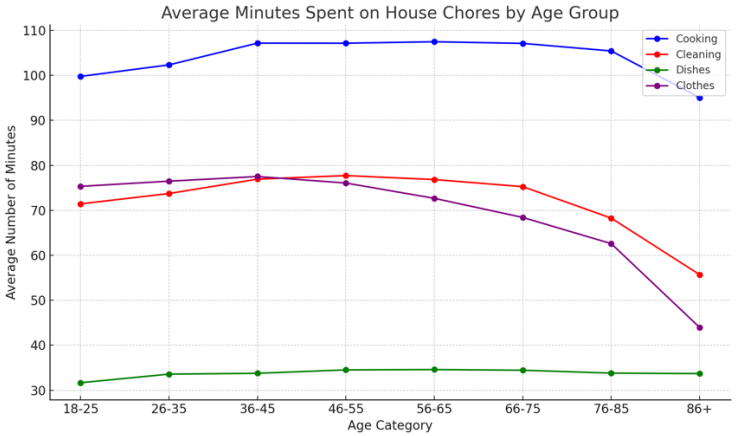
Given that the ownership of household appliances is directly related to the socioeconomic status of individuals, Table 2 presents a breakdown of appliance ownership per household across various socio-demographic segments, illuminating the disparities in access to these technologies (Matsumoto, 2016). There is a significant difference in the ownership patterns observed; households falling under the "low-low" category were less likely to own most of the listed appliances compared to those in the "medium" or "high" categories. Dishwashers do not seem to follow this trend, with even higher income brackets showcasing almost negligible ownership. This possibly indicates the lack of proliferation this appliance has experienced in Colombian households. On the other hand, the most popular appliances among Colombian households are stoves, fridges, and blenders, with ownership percentages standing at 92.16%, 89.29%, and 84.95%, respectively.

Across different age groups, there is also significant variability in the time spent performing house-related tasks. From their early 20s, women already spent significantly more time on domestic chores compared to men: they devoted 54.48% more time to cooking, 43.32% more to cleaning, 51.13% more to washing dishes, and 34.29% more to laundering clothes. By their mid-40s, the gap increased: women spent 53.57% more-time cooking, 51.14% more cleaning, 52.63% more on dishes, and 55.87% more on laundry than men (Figures 1 and 2).

Table 2: Distribution of appliances across strata

	Low-Low	Low	Medium-Low	Medium	Medium-High	High	Total	Percentage
Blender								
Yes	13121	13441	8533	2807	1131	702	39735	84.95
No	4143	2008	670	74	22	121	7038	15.05
Dishwasher								
Yes	58	97	134	99	80	119	587	1.25
No	17206	15352	9069	2782	1073	704	46186	98.75
Dryer								
Yes	1837	1290	1071	688	358	310	5554	11.87
No	15427	14159	8132	2193	795	513	41219	88.13
Fridge								
Yes	14105	14122	8820	2846	1144	727	41764	89.29
No	3159	1327	383	35	9	96	5009	10.71
Iron								
Yes	6153	9123	6938	2526	1040	611	26391	56.42
No	11111	6326	2265	355	113	212	20382	43.58
Oven Microwave								
Yes	953	2960	3552	1895	921	559	10840	23.18
No	16311	12489	5651	986	232	264	35933	76.82
Stove								
Yes	14745	14632	9002	2852	1144	730	43105	92.16
No	2519	817	201	29	9	93	3668	7.84
Vacuum								
Yes	34	270	711	591	382	290	2278	4.87
No	17230	15179	8492	2290	771	533	44495	95.13
Washer								
Yes	7959	10707	7851	2746	1121	681	31065	66.42
No	9305	4742	1352	135	32	142	15708	33.58
Total	**17264**	**15449**	**9203**	**2881**	**1153**	**823**	**46773**	**-**


Average Minutes Spent on House Chores by Age Group
Men - Cooking
Men - Cleaning
Men - Dishes
Men - Clothes
Women - Cooking
Women - Cleaning
Women - Dishes
Women - Clothes
Average Number of Minutes
Age Category
18-25
26-35
36-45
46-55
56-65
66-75
76-85
86+
20
40
60
80
100


Average Minutes Spent on House Chores by Age Group
Cooking
Cleaning
Dishes
Clothes
Average Number of Minutes
Age Category
18-25
26-35
36-45
46-55
56-65
66-75
76-85
86+
30
40
50
60
70
80
90
100
110

Empirical Specification

To test whether household appliances have reduced the amount of time women spend on household and caregiving tasks, I follow the existing literature and estimate a series of regression models that incorporate a variety of control variables to isolate the effect of household appliance ownership on time spent on household and caregiving tasks. In the first set of regressions, the first specification is as follows:

$$h_{ik} = T_{ik} + H_{ik\gamma k} + \varepsilon_{ik} \qquad (1)$$

Where h_{ik} is the number of hours in any given household i and home labor activity k spent doing a specific domestic task, T_{ik} is a vector of household appliances owned, $H_{ik\gamma k}$ is a vector of household characteristics. The number of hours spent doing domestic tasks h_{ik} is defined as the cumulative time spent on a range of activities including cooking, cleaning, doing dishes, laundry, and broadly managing household affairs. It is important to note that this variable excludes time allocated to childcare and other caregiving activities, since these are not considered in the scope of housework tasks as defined in this study. Drawing from the methodology of Sevilla-Sanz and colleagues (2010), I measure housework time h_{ik} in daily minutes.

The variable h_{ik} takes several different specifications. In the first instance, I focus only on $h_{ik,f}$, which represents the wife's time spent on activity k. In the second instance, I examine $h_{ik,m}$, representing the husband's time in activity k. In the third instance, h_{ik} is defined as $h_{ik} = h_{ik,f} + h_{ik,m}$, where $h_{ik,f}$ and $h_{ik,m}$ are respectively the wife's and the husband's time in activity k. [1] In the last instance, h_{ik} is defined as $h_{ik} = h_{ik,f} - h_{ik,m}$, where again $h_{ik,f}$ and $h_{ik,m}$ are

[1] It should be noted that the specification in Equation 1 adopts a broad interpretation of sexual orientation by excluding consideration of LGBTQIA+ couples.

respectively the wife's and the husband's time in activity k. The vector of household appliances owned T_{ik} includes washer, dryer, fridge, blender, iron, stove, microwave or oven, dishwasher, and vacuum. The vector of household characteristics $H_{ik\gamma k}$ includes the stratum the house is located[2], the combined earnings of the household, the total number of hours worked by the family, the combined age of the household, whether the household owned or rented the dwelling[3], the total size of the household.

The second specification is as follows:

$$h_{ik} = T_{ik} + H_{ik\gamma k} + I_{ik\gamma k} + \varepsilon_{ik} \qquad (2)$$

Where $I_{ik\gamma k}$ is vector of household opinions regarding housework and attitudes toward gender roles in housework. More specifically, the vector of household opinions I_{ik} includes whether both heads of the household should contribute financially to the house, whether women are naturally better at performing housework, whether a woman who works outside the home is as valuable as a woman who only performs housework. Given that South American countries, especially Colombia, are often viewed as patriarchal, opinions held by the household may significantly affect the actual distribution of domestic labor and the hours allocated to these tasks (Nuñez et al. 2015).

In the second set of regressions, I decompose further h_{ik} into four different dependent variables $h_{ik,co}$, $h_{ik,cle}$, $h_{ik,di}$, $h_{ik,clo}$, which correspond to time spent on cooking, cleaning, doing dishes, and dealing with clothes, respectively. Similarly, the technology vector T_{ik} is

[2] The Colombian Department of National planning identifies six socioeconomic strata into which homes or properties can be classified. Stratum 1 represents the lowest socioeconomic group, characterized by households with the most limited access to basic services and economic resources, whereas stratum 6 embodies the highest socioeconomic group, characterized by homes in prime location and with high-end amenities.

[3] I exclude the type of dwelling as a variable given that there has been a shift from low-rise to apartment buildings, to the extent where most of the population now resides in multi-story complexes, making it less relevant for the current study.

decomposed into $T_{ik,co}, T_{ik,cle}, T_{ik,di}, T_{ik,clo}$ corresponding to the types of technology or appliances used for cooking, cleaning, doing dishes, and dealing with clothes. The regressions are as follows:

$$h_{ik,co} = T_{ik,co} + H_{ik\gamma k} + I_{ik\gamma k} + \varepsilon_{ik} \quad (3)$$

$$h_{ik,cl} = T_{ik,cl} + H_{ik\gamma k} + I_{ik\gamma k} + \varepsilon_{ik} \quad (4)$$

$$h_{ik,di} = T_{ik,di} + H_{ik\gamma k} + I_{ik\gamma k} + \varepsilon_{ik} \quad (5)$$

$$h_{ik,cl} = T_{ik,cl} + H_{ik\gamma k} + I_{ik\gamma k} + \varepsilon_{ik} \quad (6)$$

This level of granularity allows for a more nuanced understanding of the specific effects of different types of household technology on various domestic tasks. For instance, it can reveal whether a dishwasher ($T_{ik,di}$) has a greater or lesser impact on time spent washing dishes ($h_{ik,di}$) compared to a high efficiency washing machine's impact on time spent cleaning clothes ($h_{ik,clo}$).

Empirical Results

Total Time Spent Performing Household Tasks

Table 3 presents the outcomes of the regression analysis for Model 1, focusing on the relationship between total hours of housework and various independent variables, separated by gender and combined households. For women, several variables stand out as statistically significant. The presence of a dryer, fridge, and blender in the household are associated with a decrease in total hours of housework, suggesting that these appliances may alleviate the burden of chores. Earnings show a negative relationship with housework, possibly indicating that higher-earning women may outsource some household tasks. Age and hours worked outside the home are also negatively correlated with housework, which is consistent with the idea that older individuals and those who work more hours may have less time or inclination for household chores. For men, the presence of a dryer and fridge is also significant but shows a negative

relationship with housework, suggesting that these appliances may reduce the need for manual labor in chores. Unlike women, men's earnings are not significantly related to housework, but age and hours worked outside the home are negatively associated, like the findings for women.

In the combined model, the results largely mirror those found in the gender-specific models, with household appliances like dryers and fridges showing a negative relationship with housework. Age and hours worked outside the home continue to be negatively associated with housework, while household size shows a significant positive relationship, indicating that larger households may require more overall housework. More so, the results from the regression looking at the difference between women's and men's total time spent on house chores shows that while washers, fridges, blenders are associated with greater disparities, dryers, ovens, microwaves, and vacuums tend to bridge this gap, indicating a more equitable distribution of household labor when these appliances are present. This observation suggests that certain appliances might play a role in reducing the traditional gender-based division of labor within households.

Table 4 extends the analysis by incorporating additional variables related to social beliefs and opinions into Model 2. These new variables aim to capture the underlying social norms and attitudes that may influence the division of housework. For women, the addition of these new variables offers some interesting insights. The belief that a working mother is as good as a stay-at-home mother is negatively associated with total housework hours, suggesting that more progressive views on gender roles may lead to a more equitable division of labor at home. Similarly, the belief that women are better at housework is positively associated with total housework hours, reinforcing traditional gender roles. For men, the belief that both genders should contribute to household income is positively associated with total housework hours,

perhaps indicating a more balanced approach to domestic responsibilities in households where this view is held. Interestingly, the belief that women are better at housework is negatively associated with men's housework hours, suggesting that traditional views on gender roles may lead men to contribute less to housework.

In the combined model, the results are consistent with the gender-specific models. The belief variables, such as average opinions on whether a working mother is as good as a stay-at-home mother and whether women are better at housework, show similar associations with total housework hours. This suggests that household-level attitudes and beliefs can have a significant impact on the division of housework, beyond the effects of individual demographic and economic factors. The regression focusing on the difference between women’s and men’s total time spent on house chores shows unsurprisingly that households believing that women are better at housework tend to have a wider gap in the division of housework, with women taking on a disproportionately larger share of the chores. On the other hand, households in which both members belief that men and women should have equal rights and responsibilities in both domestic and professional spheres tend to exhibit a more balanced division of housework.

Table 3: Regression Results for Model 1

	Total Hours Worked			
	Women	Men	Combined	Difference
Intercept	282.55***	183.94***	68.98***	9.56**
	(4.27)	(3.23)	(3.18)	(3.90)
Washer	0.84	-1.68	2.39	11.76***
	(1.72)	(1.26)	(1.74)	(2.13)
Dryer	-12.68***	-10.91***	-18.51***	-4.88*
	(2.10)	(1.56)	(2.18)	(2.67)
Fridge	7.14**	-5.54**	7.40**	23.86***
	(2.56)	(1.75)	(2.49)	(3.05)
Blender	5.74*	-2.02	11.20***	27.53***
	(2.24)	(1.56)	(2.19)	(2.69)
Iron	-1.00	1.93	-1.02	-1.68
	(1.60)	(1.18)	(1.63)	(1.99)
Oven_Microwave	-6.90***	6.17***	-4.82*	-12.49***
	(1.87)	(1.39)	(1.92)	(2.35)
Dishwasher	-13.46*	-4.92	-15.01*	-9.65
	(6.15)	(4.55)	(6.28)	(7.71)
Vacuum	-3.86	9.35***	1.97	-8.23*
	(3.41)	(2.53)	(3.49)	(4.28)
Stratum	-9.56***	2.04***	-9.61***	-14.68***
	(0.72)	(0.52)	(0.71)	(0.88)
ln_Earnings	-1.96***	-0.18*	-0.63***	-1.20***
	(0.16)	(0.08)	(0.12)	(0.15)
Age	-0.54***	-0.27***	-0.30***	-0.49***
	(0.05)	(0.04)	(0.03)	(0.04)
Hours_Worked	-1.82***	-0.87***	-1.29***	-1.21***
	(0.04)	(0.02)	(0.03)	(0.03)
Own_Rent	5.26***	-0.79	5.47***	5.94***
	(1.45)	(1.06)	(1.47)	(1.81)
Household_Size	12.24***	-41.20***	163.37***	142.63***
	(1.22)	(0.97)	(2.18)	(2.67)

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

• Standard errors are in parenthesis

Table 4: Regression Results for Model 2

	Total Hours Worked			
	Women	Men	Combined	Difference
Intercept	278.42***	192.24***	70.98***	2.84
	(4.85)	(3.60)	(3.93)	(4.80)
Washer	1.04	-2.42	2.30	11.92***
	(1.72)	(1.26)	(1.74)	(2.12)
Dryer	-12.81***	-9.12***	-17.27***	-2.51
	(2.12)	(1.57)	(2.20)	(2.69)
Fridge	7.46**	-5.72**	7.55**	23.78***
	(2.56)	(1.74)	(2.49)	(3.04)
Blender	6.03**	-2.39	10.99***	26.54***
	(2.24)	(1.55)	(2.20)	(2.68)
Iron	-0.39	1.41	-0.46	-0.35
	(1.60)	(1.18)	(1.63)	(1.99)
Oven_Microwave	-6.21***	5.03***	-4.38*	-10.98***
	(1.87)	(1.39)	(1.92)	(2.35)
Dishwasher	-13.41*	-4.39	-15.09*	-10.69
	(6.15)	(4.53)	(6.28)	(7.68)
Vacuum	-4.09	9.23***	2.28	-8.06
	(3.41)	(2.52)	(3.49)	(4.27)
Stratum	-8.74***	0.91	-9.49***	-13.89***
	(0.72)	(0.52)	(0.72)	(0.88)
ln_Earnings	-1.91***	-0.21*	-0.60***	1.15***
	(0.16)	(0.08)	(0.12)	(0.15)
Age	-0.60***	-0.20***	-0.32***	-0.54***
	(0.05)	(0.04)	(0.04)	(0.04)
Hours_Worked	-1.81***	-0.87***	-1.29***	-1.21***
	(0.04)	(0.02)	(0.03)	(0.03)
Own_Rent	5.06***	-0.42	5.31***	5.35***
	(1.45)	(1.06)	(1.47)	(1.80)
Household_Size	12.03***	-40.60***	164.31***	144.83***
	(1.22)	(0.96)	(2.18)	(2.67)
MotherWorkingQuality	-1.66**	-0.82	-1.10	-0.72
	(0.61)	(0.42)	(0.67)	(0.82)
GenderIncomeContribution	0.73	1.95***	0.75	-0.56
	(0.65)	(0.46)	(0.73)	(0.89)
WomanMarriageGoal	-0.03	-0.16	-0.20	-1.98***
	(0.47)	(0.31)	(0.50)	0.61
WomenBetterHousework	3.99***	-4.02***	2.88***	11.56***
	(0.46)	(0.38)	(0.51)	(0.62)
WomenMenEqualRightsFun	-1.63**	1.03**	-1.65**	-3.24***
	(0.55)	(0.39)	(0.61)	(0.74)
ManHeadOfHousehold	0.53	-1.29***	-1.64***	-4.97***
	(0.44)	(0.31)	(0.47)	(0.58)

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

• Standard errors are in parenthesis

Total Time Spent Performing Specific Household Tasks – Disaggregated

Building upon the outcomes presented in Table 3 and Table 4, Table 5 focuses on the regression results for Models 3 to 6, which delve into the time spent on specific household tasks such as cooking, cleaning, doing dishes, and dealing with clothes. Similarly, to the first set of regressions, the second set also considers individual members of the household, the combined heads of the household, and the difference of time spent in chores for these individuals. Additionally, these models control for a variety of variables, including social beliefs and attitudes, to provide a more comprehensive understanding of how household chores are influenced by both technological and social factors.

The findings reveal interesting patterns when household chores are disaggregated. For chores related to clothing, men see a significant reduction in time spent when they own a washer and dryer. Interestingly, the impact of these appliances is somewhat more pronounced when social beliefs are considered. Women experience a strong time-saving effect from washers, but the presence of a dryer does not yield a significant impact, particularly when social norms are considered.

In the realm of cooking, the presence of a blender increases the time spent on this task for women but has no significant effect on men. Fridges and ovens or microwaves, however, show an intriguing dynamic: fridges seem to increase cooking time for women but reduce it for men, while ovens or microwaves significantly cut down cooking time for women but have the opposite effect for men. For cleaning tasks, men surprisingly spend more time cleaning when a vacuum cleaner is present. This effect is not mirrored in women, for whom the vacuum cleaner doesn't significantly alter the time spent on cleaning. When it comes to doing dishes, dishwashers significantly reduce the time spent for women but not for men. This finding might imply that

women are either more likely to use dishwashers or that they typically have greater responsibility for this chore, hence the time-saving effect is more pronounced for them.

Table 5: Regression Results

	Men		Women		Combined		Difference	
	Without	With	Without	With	Without	With	Without	With
Clothing								
Washer	-1.86***	-1.98***	-3.47***	-3.24***	-3.29***	-3.04***	0.22	0.51
	(0.27)	(0.27)	(0.64)	(0.64)	(0.58)	(0.58)	(0.59)	(0.60)
Dryer	-1.84***	-1.61***	0.08	-0.49	-1.34	-1.70*	1.13	0.85
	(0.35)	(0.35)	(0.81)	(0.82)	(0.77)	(0.77)	(0.78)	(0.79)
Iron	-0.12***	-0.23	-1.85**	-1.58**	-1.75**	-1.37*	-0.97*	-0.54
	(0.25)	(0.25)	(0.59)	(0.59)	(0.55)	(0.55)	(0.56)	(0.56)
Cooking								
Blender	-0.70	-1.02	2.63***	2.47**	5.71***	5.31***	12.02***	11.55***
	(0.62)	(0.62)	(0.96)	(0.96)	(0.88)	(0.88)	(1.11)	(1.11)
Fridge	-1.92**	-2.15**	3.84***	3.76***	5.04***	4.80***	11.39***	11.24***
	(0.70)	(0.70)	(1.10)	(1.10)	(1.01)	(1.01)	(1.28)	(1.28)
Oven/Microwave	1.81**	1.06	-4.31***	-4.25***	-3.71***	-3.88***	-4.91***	-4.28***
	(0.55)	(0.55)	(0.80)	(0.80)	(0.77)	(0.77)	(0.97)	(0.97)
Cleaning								
Vacuum	4.01**	3.94	-0.01	0.06	2.34	2.55	-1.82	-1.62
	(1.26)	(1.26)	(1.60)	(1.60)	(1.67)	(1.67)	(1.79)	(1.79)
Dishes								
Dishwasher	-0.44	-0.34	-2.59*	-2.60*	-2.61*	-2.53*	-2.02	-2.03
	(0.74)	(0.74)	(1.20)	(1.20)	(1.15)	(1.15)	(1.30)	(1.29)

*** Significant at the 0.001 level

** Significant at the 0.01 level

* Significant at the 0.05 level

• Standard errors are in parenthesis

Robustness Tests

I carry out further tests to check the robustness of our results. I drop men heads of household who perform household tasks to ensure that the results are not being driven by a small subgroup of the population. This is to test the sensitivity of the results to changes in the sample composition. Moreover, I also conduct tests by sequentially excluding one appliance at a time from the regression to assess whether the results are being overly influenced by any single appliance. These regressions showed that the key findings remained substantially unchanged, suggesting a robust relationship between appliance ownership and chore time that was not unduly influenced by the inclusion or exclusion of any single appliance.

To strengthen the robustness of the findings, I also explore alternative specifications for the dependent variable, such as employing the logarithm of the total minutes spent on chores to address potential non-linear relationships and to mitigate the impact of extreme values. Similarly, the results from the alternative specifications largely confirmed the main findings, demonstrating that the relationships identified in the primary analysis were not an artifact of the specific way the dependent variable was measured. Lastly, I explore the interaction effects between appliance

ownership and social beliefs to understand how these factors jointly influence the time spent on household chores. The results suggest that the impact of appliances on reducing housework time is more pronounced in households with more egalitarian beliefs regarding gender roles. This indicates that the combination of technology and progressive social norms can lead to a more equitable distribution of household labor.

Discussion

The series of regression models presented in this study aim to provide a comprehensive understanding of how household appliance ownership and social beliefs and attitudes influence the time spent on household and caregiving tasks. The empirical findings yield several key insights that extend our understanding of domestic labor dynamics.

Firstly, household appliances do indeed have a significant impact on how time is allocated for housework, but this impact is not consistent across all tasks or between genders. On average, women spend more time on household chores than men, a difference that is especially pronounced in specific categories of housework. Women spend approximately 5 times more time on food-related activities, 7 times more time on clothing-related activities, and 2.5 times more time on cleaning activities than men. These findings are in line with existing research, which posits that despite advances in gender equality, women still shoulder a disproportionate burden of domestic labor. Additionally, there seems to be an interesting relationship between age and the amount of housework performed, as middle-aged women tend to spend more time on household tasks compared to both younger and older women. This could be attributed to a variety of factors, such as increased family responsibilities or increased cleanliness standards.

Once I account for technological appliances, namely washers, dryers, irons, blenders, fridges, ovens, microwaves, vacuums, and dishwashers, several intriguing patterns emerge. The

impact of these appliances is not uniform across categories. Specifically, irons, microwaves, and ovens appear to increase the time spent on chores, while dryers and fridges have the opposite effect, reducing the time required. There are several possible explanations for these findings. For instance, the increased time associated with irons and ovens might be due to these appliances enabling more complex tasks that take additional time, such as ironing more delicate fabrics or cooking more elaborate meals. On the other hand, dryers and fridges may reduce time spent on chores because they automate or simplify tasks like drying clothes or preserving food, thereby making these tasks more efficient.

Furthermore, the data reveals that social beliefs and attitudes also play a crucial role in the allocation of domestic labor. Specially, households with more progressive gender views tend to have a more equitable distribution of housework. For example, the belief that men and women should enjoy the same rights is associated with reduced housework time for women. Conversely, traditional views on gender roles, such as the belief that women are naturally better at housework, are associated with women spending more time on chores. These social factors interact with technological factors in complex ways, often amplifying or mitigating the time-saving effects of household appliances. The study also highlights the role of economic factors, such as earnings and hours worked outside the home, in shaping domestic labor dynamics. Higher-earning women tend to spend less time on household chores, possibly because they have the resources to outsource some of these tasks. Similarly, both men and women who work longer hours outside the home tend to spend less time on housework, likely due to time constraints. Household size is also an important factor that influences the amount of time spent on domestic chores. Larger households generally require more overall housework, and the results indicate that household size has a significant positive relationship with time spent on chores. This suggests

that the burden of domestic labor may increase with the number of people in the household, especially for women who already bear a disproportionate share of this labor.

Upon further disaggregation by task and technology associated with each task, we find that the impact of specific appliances can vary greatly depending on the nature of the chore. For instance, dishwashers have a more significant time-saving impact on women, possibly indicating that they usually handle this specific task more often than men. Similarly, the presence of a vacuum cleaner surprisingly leads to an increase in time spent on cleaning for men but not for women, suggesting that men might be more willing to perform this task when the technology is available. Moreover, fridges and microwaves or ovens present an intriguing case as fridges seem to increase cooking time for women but reduce it for men, while ovens or microwaves significantly cut down cooking time for women but have the opposite effect for men. This may be possible due to several reasons.

First, the difference in time spent could reflect the types of meals being prepared. Women might be using fridges for more complex recipes that require various ingredients that need to be stored and prepared, thereby increasing their cooking time. Men, on the other hand, might be using fridges in a way that simplifies their cooking processes, such as storing pre-cooked meals that can quickly be heated and served, thus reducing their cooking time. Secondly, the contrasting impact of ovens and microwaves on men and women could be related to the types of cooking methods preferred by each. Women may be more inclined to use ovens for baking or roasting, which, while time-intensive, can often be left unattended, thus reducing the active cooking time. Men, conversely, might be using ovens and microwaves for quicker but more hands-on cooking methods, like grilling or reheating, which could explain the increase in their cooking time. Thirdly, these differences might be influenced by traditional gender roles that

dictate the kinds of domestic responsibilities men and women are 'supposed' to undertake. For instance, the reason why ovens and microwaves reduce cooking time for women but increase it for men may be rooted in societal expectations that women are the primary cooks in the household. As a result, women may be more efficient in using these appliances or more likely to use them for meals that require less active time, while men may use them for more labor-intensive tasks, resulting in more time spent cooking.

Conclusion

This paper aimed to investigate the intricate dynamics of household labor distribution in Colombia, with a particular focus on understanding the role of technological advancements in shaping the 'second shift' of unpaid domestic work that predominantly falls on women. Drawing from a rich dataset provided by the 2020-2021 Colombian Time Use Survey, the analysis uncovered nuanced narratives that straddle the realms of technology, gender norms, and socio-demographic landscapes.

The findings reveal that while technological advancements, in the form of household appliances, have been associated with a reduction in chore time, others have correlated with an increase, unveiling a complex landscape where technology sometimes aids in reducing labor, but can also escalate the standards of home upkeep, demanding more time and effort. Additionally, the relationship between age and total time spent on housework seems to hint at an inverse U-shaped curve, suggesting that individuals in their middle years may bear the brunt of household labor compared to younger or older age groups. This could be attributed to a variety of factors such as child-rearing responsibilities, career demands, and possibly even peak years of home ownership, which often come with increased maintenance tasks. The study also found that gender norms continue to play a significant role in the distribution of household labor, with

women disproportionately shouldering the 'second shift' despite technological advancements. The set of independent variables focused on household's opinions showed that households with more progressive opinions about gender roles tended to have a more equitable distribution of domestic labor. However, even in these households, women still performed a greater share of the work, indicating that while attitudes are important, they are not sufficient in overcoming deeply ingrained societal norms.

Future research should aim to delve deeper into the specific types of technologies that either alleviate or exacerbate the burden of household labor. It would be beneficial to explore how emerging technologies like smart home systems, robotics, and AI-powered devices interact with existing gender norms and expectations around domestic work. Additionally, longitudinal studies could provide insights into the long-term effects of technology adoption on household labor dynamics. Finally, future studies could benefit from a comparative approach, examining how household labor dynamics in Colombia differ from or align with those in other Latin American countries or globally.

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