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Reducing and Redistributing Unpaid Work: Stronger Policies to Support Gender Equality

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Abstract

Unpaid work, such as caring for children, the elderly, and household chores represents a significant share of economic activity but is not counted as part of GDP. Women disproportionately shoulder the burden of unpaid work: on average, women do two more hours of unpaid work per day than men, with large differences across countries. While much unpaid care work is done entirely by choice, constraints imposed by cultural norms, labor market features or lack of public services, infrastructure, and family-friendly policies matter. This undermines female labor force participation and lowers economy-wide productivity. In this paper, we examine recent trends in unpaid work around the world using aggregate and individual-level data, explore potential drivers, and identify policies that can help reduce and redistribute unpaid work across genders. Conservative model-based estimates suggest that the gains from these policies could amount to up to 4 percent of GDP.

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I. INTRODUCTION

Unpaid work is an important aspect of economic activity and well-being of individuals. Tasks such as caring for children, the elderly, and household chores are indispensable for our daily lives. While unpaid work consumes a significant part of our day, it mostly falls outside the system of national accounts and is not counted as part of GDP. Much unpaid care work is done entirely by choice, and no one can dispute the importance of raising and rearing a child for future economic growth. But too often women are forced to bear the burden of domestic chores, and time spent on unpaid work reflects constraints imposed by cultural norms, lack of public services and infrastructure, or family leave policies.

Reducing and redistributing unpaid work is a macro-critical issue. Constraints to female labor force participation due to an uneven burden of unpaid work can result in resource misallocation. When women do not fully exploit their productivity potential by remaining outside of the workforce to perform relatively low-productivity household tasks, economic growth may be lower than otherwise. A workforce with fewer women also implies lower gains from exploiting the complementarity between female and male labor (Ostry and others, 2019). In addition, even for women who do paid work, occupational downgrading is common as women choose jobs at a lower skill level or engage in part-time work to balance paid and care work (Connolly and Gregory, 2007; Garnero and others, 2013). Women's higher prevalence in part-time work arrangements is one of the key drivers of observed gender wage gaps, creating a feedback loop for gender inequality in unpaid work (Blau and Kahn, 2017). Recognizing the gender inequality in unpaid work—the proportion of time spent on unpaid work disaggregated by gender—is one of the key indicators under the Sustainable Development Goals (SDGs) to help boost female labor force participation.²

In this paper, we focus on unpaid work from the perspective of gender inequality. We explore drivers of unpaid work around the world and analyze recent trends in advanced economies using evidence from time use surveys. Specifically, we use average time use statistics by gender at the country-level as well as more granular time use surveys at the level of the individual. Finally, we identify policies that can reduce and redistribute unpaid work and estimate the gains from addressing gender imbalances in unpaid work.

On average, women do more than two more hours of unpaid work per day than men. We find that as countries get richer, the hours people spend on unpaid work fall, particularly in domestic chores. Richer economies can afford “engines of liberation.”³ In developing economies, unpaid

² Elson (2017) differentiates three stages of dealing with the issue on women's unpaid work, *recognize, reduce, and redistribute*.

³ Greenwood and others (2005) point to the introduction of new consumer durables such as dishwashers and vacuum cleaners as a force behind liberating women from housework. Cubas (2016) also finds that lower prices of household appliances and access to infrastructure boost female labor force participation in developing

work is often linked to subsistence requirements—providing food, shelter and caring for family members in a very labor-intensive fashion. As economies develop, improved household technologies, and the introduction of labor-saving consumer durable goods results in less time spent on domestic chores, which account for the largest share of unpaid work.

Despite the proliferation of labor-saving household technologies and shifting family landscape in many economies, traditional gender imbalances in unpaid work remain in most countries. Even in double-earner households, women assume a greater share of care work and domestic chores. We show that, while men have increased their time spent on unpaid work, women still spend from 20 to 1,000 percent more time than men around the world. Evidence suggests that advanced economies have experienced reductions in the gender gap in unpaid work hours in recent years (Bick and others 2018; Fang and McDaniel 2017). Consistent with this, we find that, over time, women are doing more paid and less unpaid work in advanced economies, while the opposite is true for men. The decline in unpaid work is driven by changes in the time allocation within couples. In terms of employment, the reduction in female unpaid work is driven by women in part-time employment, whereas men spend more time on unpaid work. In terms of education, more educated women in advanced economies are engaged in paid work, whereas men across all levels of education are doing more unpaid work.

We also provide evidence that unpaid work is driven by labor market institutions, demographics, and social institutions. Female unpaid work is negatively correlated with female labor force participation. Laws, regulations, and other social institutional constraints that restrict women's ability to work, manage their wealth, or run businesses are associated with higher female unpaid work and lower male unpaid work.

To quantify the effects of policies encouraging women's participation in paid work, we use a model featuring market and unpaid home production by women and men. We run a counterfactual scenario, where barriers to women's paid work across 18 advanced and emerging economies are reduced to the level of Norway—one of the most egalitarian countries in the sample. Our findings suggest sizable gains in output for countries which depend on the initial gender gaps in hours of unpaid work. In Pakistan and Japan, for instance, policies that reduce constraints to women's paid work yield between three to four percent of GDP and over 35 percent reduction in the unpaid hours gender gap. Countries with more equal allocation of paid and unpaid work between men and women gain less from targeted policies. However, the model predicts that further productivity growth of the services sector would encourage gradual marketization of household production and higher female labor force participation.

Our paper contributes to the literature on the gender imbalances on unpaid work. We build on a large literature studying drivers of female labor force participation (for a summary, see Jain-

countries. Ilahi and Grimard (2000) find that improvements in public supply infrastructure reduce time spent by women collecting water in rural Pakistan.

Chandra and others, 2018), but focus instead on unpaid work. Our empirical approach based on microdata of time use surveys relates to recent work by Bridgman and others (2018), Bick and others (2018), and Fang and McDaniel (2017). We complement these studies by offering further disaggregation on individual characteristics driving levels and trends in unpaid work. Our modeling approach follows Ngai and Petrongolo (2017), but instead of using the model to study the rise of female labor force participation in the context of structural transformation, we attempt to quantify the gains of policies to reduce and redistribute unpaid work. In this sense, our approach is most closely related to Alvarez (2019), although our calibration strategy is different.

The rest of the paper is organized as follows. Section II explores the nature of unpaid work with cross-country and individual level data. Section III looks at potential drivers of unpaid work and Section IV identifies policies that can help reduce and redistribute unpaid work. Section V quantifies the gains of reducing imbalances in unpaid work. Finally, Section VI concludes.

II. THE NATURE OF UNPAID WORK AROUND THE WORLD

A. The Value of Unpaid Work

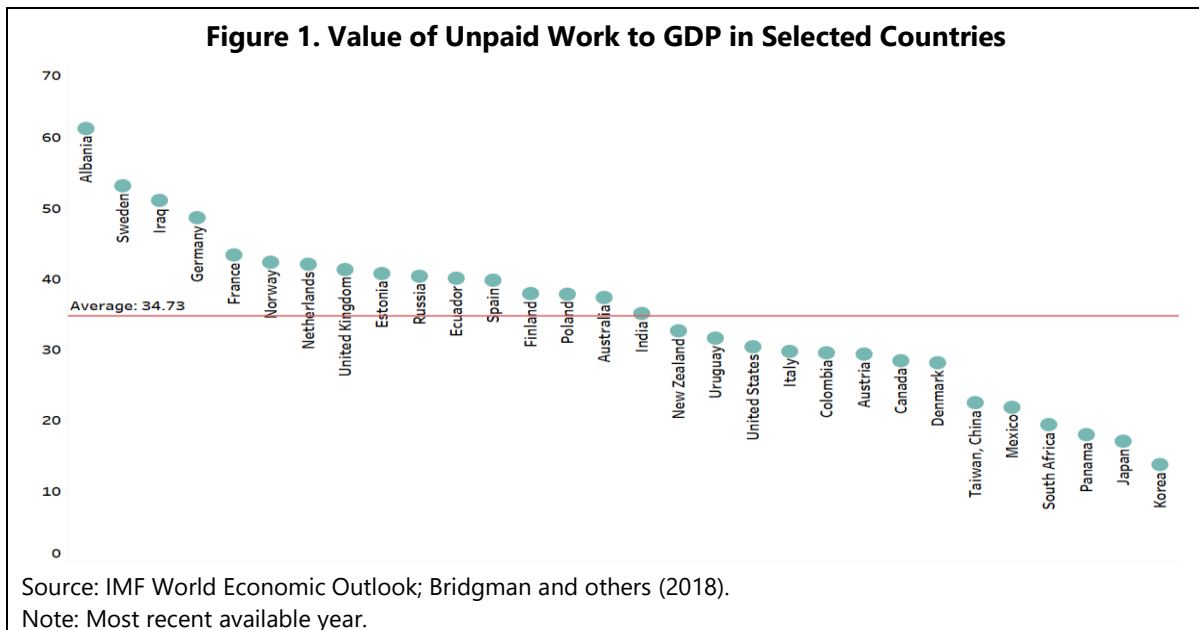
Unpaid work—home production or non-market production—is defined as work not compensated by a wage. As a result, it generally falls outside the standard definition of economic output. Unpaid work broadly comprises of two areas of activities: (i) care work for children, the elderly and the sick and (ii) domestic chores—cleaning and household upkeep; construction and repairs; cooking and food production; household management and shopping, volunteering. Both categories include the time spent traveling to perform those tasks.

Since unpaid work is comprised of non-market activities, there is no observable price for the services provided and it is generally difficult to quantify in national accounts data. Unpaid work is thus not included in GDP. However, we know that the amount of unpaid work is substantial.⁴ In recent years, a detailed account of unpaid work has been made possible by the systematic collection of time use data. Time use data show how many hours individuals devote to paid and unpaid work, as well as leisure and personal care. Unlike labor force surveys, time use surveys capture both market (or paid) work and non-market (or unpaid) activities and can help uncover behavioral choices in time allocation. The surveys also reveal differences based on gender, age, and location.⁵ In this paper, we use average time use statistics by gender for 90 countries and

⁴ There are two ways to measure unpaid work: the input method and the output method. The input method counts hours worked in unpaid activities using a comparative wage rate. The output method measures the results of unpaid work by assigning a price to goods and services produced.

⁵ Cross-country comparison of time-use surveys is subject to several caveats. Care work for others tends to be underreported as time spent caring for people often overlaps with other activities (e.g., people report doing housework while they are on call to provide care for small children). Also, time use surveys usually differ in design and methods. Given the inclusion of a reduction in female unpaid work as one of the sustainable development goals, there are renewed efforts to improve data quality.

individual-level surveys for 18 countries (see appendix for details). Using time use surveys and a replacement cost approach, where the value of each task is imputed from the price of hiring a worker to perform it, Bridgman and others (2018) estimate the value of unpaid work in a number of countries. They find that unpaid work accounts for roughly 35 percent of GDP on average in their sample, but it varies widely, ranging from 10 percent of GDP in Korea to 60 percent of GDP in Albania (Figure 1). Using a similar methodology for a smaller sample of countries, UNRISD (2010) finds that the value of unpaid work ranges from 10 to 39 percent of GDP.

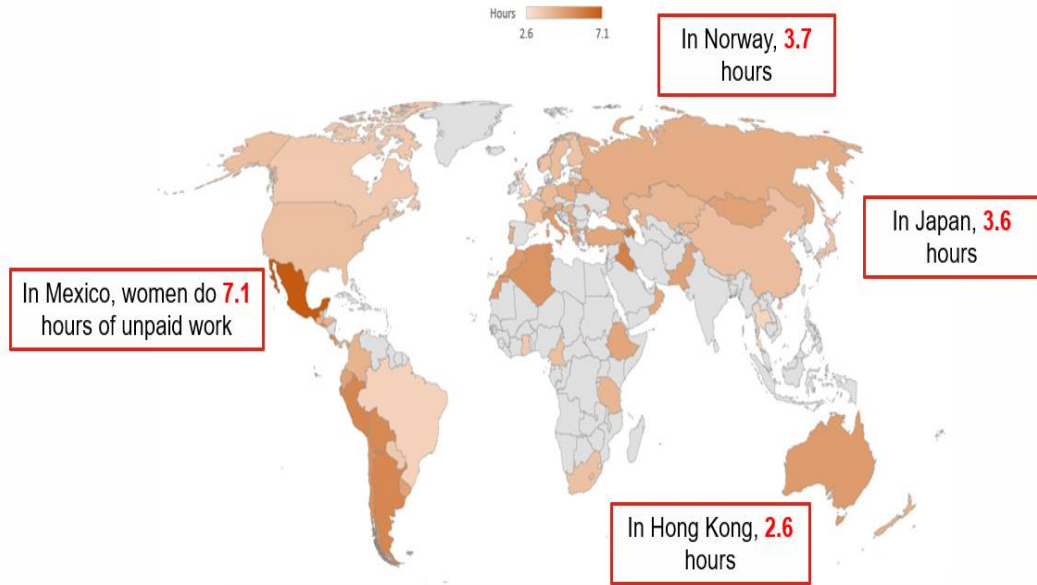


B. The Gender Gap in Unpaid Work

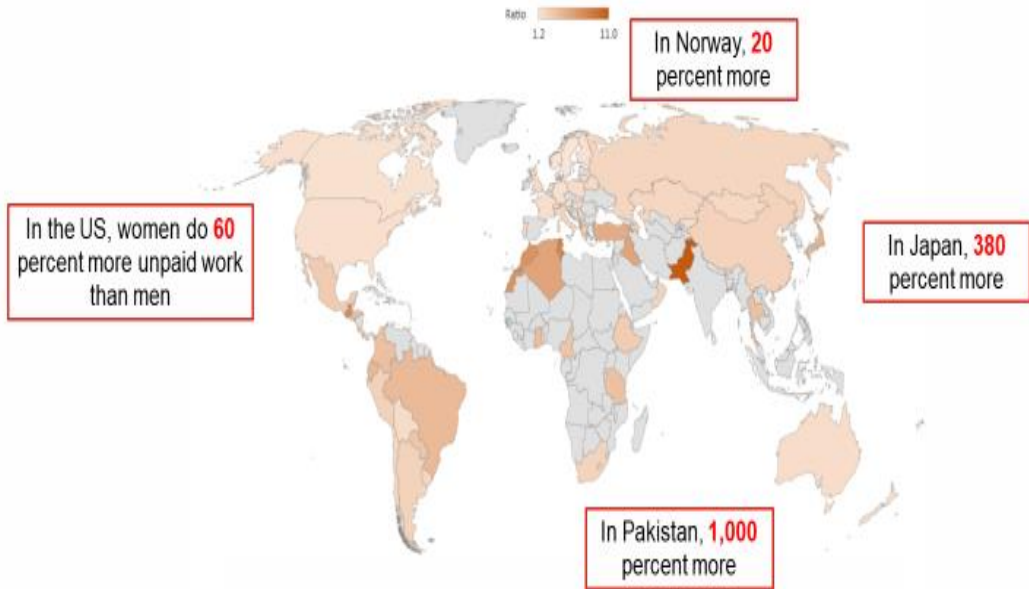
Unpaid work falls disproportionately on women. On average, women do more than two more hours of unpaid work per day than men, but there is wide variation across countries (Figure 2, panel 1). Women in Hong Kong spend 2.6 hours a day on unpaid work, and in Mexico 7.1 hours. Gender imbalances in the distribution of unpaid work varies significantly across countries (Figure 2, panel 2). In Norway, one of the most egalitarian countries in the world, women do 20 percent more unpaid work than men. The corresponding number is 60 percent in the U.S. In Japan, women do 4 times as much unpaid work as Japanese men. Uneven distribution of unpaid work can be explained partly by persistent gender wage gaps and gender-based comparative advantages in unpaid work but also by barriers and constraints imposed by culture, regulations, and lack of family-friendly policies.

Figure 2. Unpaid Work Around the World

1. Number of hours of female unpaid work



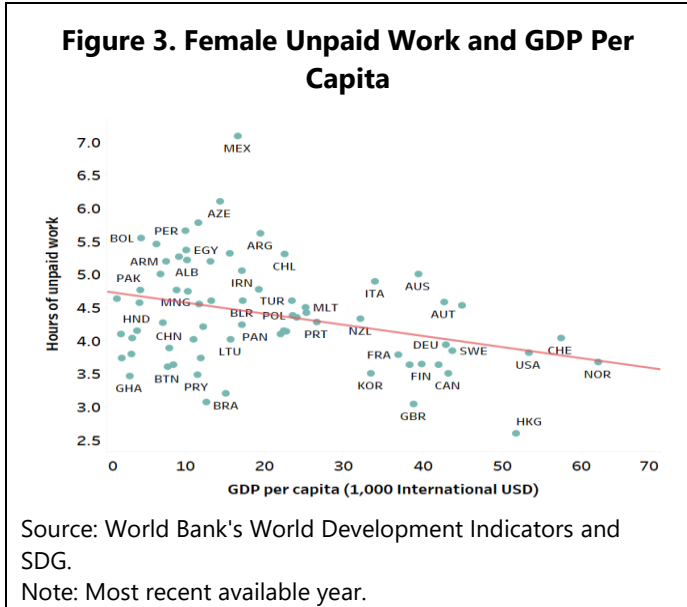
2. Ratio of female to male unpaid work



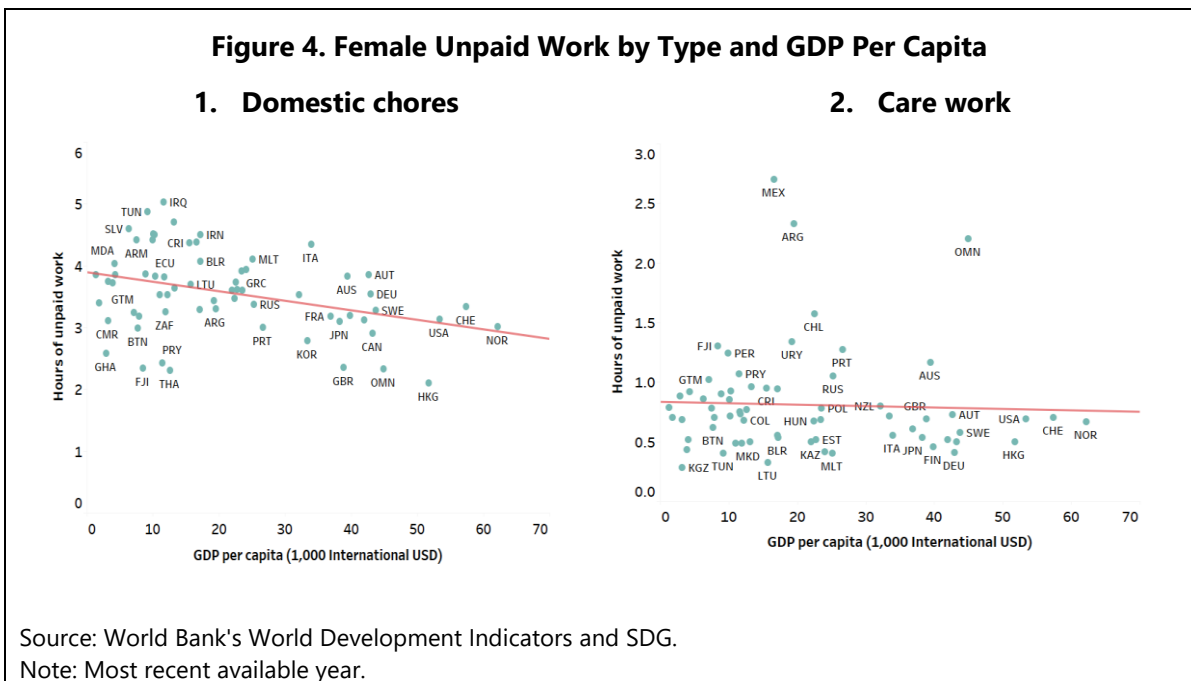
Source: SDG.

Note: Most recent available year.

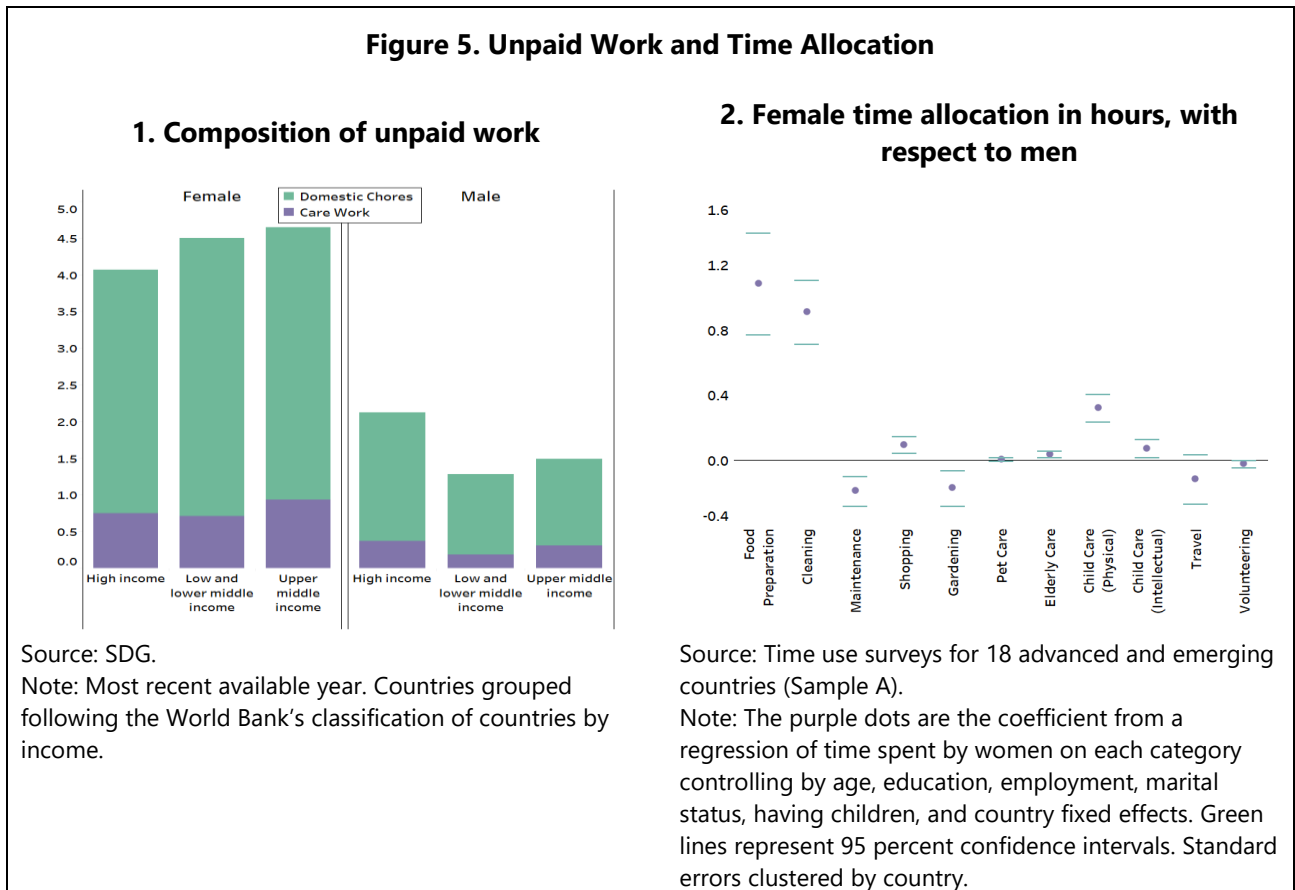
Unpaid work by women tends to decline with the level of economic development of a country (Figure 3). This reflects both a *reduction* and a *redistribution* of unpaid work. As economies get richer and female labor force participation rises, a larger share of tasks is traded in the marketplace instead of being performed at home. At the same time, unpaid work by men increases, allowing for a redistribution of unpaid work by gender and an increase in paid work by women. A notable increase in male unpaid work (i.e., sharing unpaid work with women) in advanced economies may be one of the factors that enabled women to participate in the labor force in recent years.



The decline in unpaid work as countries become richer is explained by reductions in domestic chores. Women spend fewer hours on domestic chores as the economy becomes richer (Figure 4), a decline that is statistically and economically significant. However, there is little or no relationship between hours spent on care work by women and GDP per capita. This suggests that economic development and new technologies are able to reduce the burden of domestic chores, but less so for care work.



Domestic chores represent the vast majority of unpaid work. On average, domestic chores account for over 80 percent of total hours spent on unpaid work (Figure 5, panel 1). In high-income countries, women spend 4.1 hours on domestic chores, roughly half an hour less than their peers in emerging and developing economies. Time-use surveys from 18 high- and middle-income economies show that women spend almost two hours more than men preparing food and cleaning (Figure 5, panel 2). They also spend significantly more time shopping and taking care of children. On the other hand, care work is stable across income groups (slightly less than one hour per day). Men increase both their domestic chores and care work in richer countries. On average, men in high-income countries double their amount of time spent on care work with respect to low and lower-middle income countries from 0.2 to 0.4 hours per day. They also increase the amount of time spent on domestic chores from 1.1 to 1.8 hours per day.



C. Individual Characteristics Driving Unpaid Work

Time allocation can be traced back to family characteristics, education, and employment status using microdata. We complement the cross-country analysis by examining evidence on unpaid work for 18 advanced and emerging economies (Sample A, as discussed in the appendix) covering around 300,000 individuals older than 15. Around 54 percent of the sample is women.

We use the most recent time use survey available since 2000 for each country. To examine the individual drivers of unpaid work, we estimate the following specification separately for males and females, and for paid and unpaid work:

$$Time_i = \beta_1 Has\ Partner_i + \beta_2 Has\ Children_i + \beta_3 Number\ of\ Children_i + \Gamma Education_i + \Phi Employment_i + \Lambda Age_i + \kappa_c + \varepsilon_i$$

where i identifies the individual and $Time_i$ is the time individual i spends on unpaid or paid work on a representative day of the week. Variables $Has\ Partner_i$, $Has\ Children_i$, and $Number\ of\ Children_i$ capture relevant characteristics of the individual's family composition, while $Education_i$, $Employment_i$, and Age_i are vector dummies on the individual's educational attainment (less than secondary, secondary, and more than secondary) and employment status (full-time, part-time, and not in the labor force). Country fixed effects are denoted by κ_c and account for all country-specific factors influencing the individual's time allocation. Standard errors are clustered at the country level to account for potential correlation in the cross section within each country.

The results from the regression are reported in Table 1. Household composition weighs on female's time allocation much more than it does for males. In particular, having children and a partner increase the amount of unpaid work more for women than for men, and correspondingly decrease the amount of time spent on paid work. Women with a partner spend 1.5 hours more on unpaid work than single women, whereas the increase in unpaid work for men with a partner relative to single men is only 20 minutes.

Only women with higher education substitute unpaid work with paid work to some extent. Women with more than secondary education reduce their unpaid work by half an hour with respect to women with less than secondary education, a result that is statistically significant. However, this still represents less than an eighth of the 4 hours that women spend on unpaid work on average.

The "second shift" remains a reality for employed women. A woman employed full-time does 5 hours of paid work but she cuts the time spent on unpaid work by only 2.7 hours with respect to a woman who is not employed. As a result, her work day expands by 2.3 hours, a phenomenon denoted as the "second shift" of work at home after working in the marketplace (Hochschild and Machung, 1989). In addition, women and men exhibit a similar drop in paid work when only working part-time. However, the increase in unpaid work is 50 percent higher for women than for men. The gender imbalance in unpaid work is even larger when moving from full-time employment to not employed.

Table 1. Impact of Individual Characteristics on Time Allocation (in hours)

	Male		Female	
	Unpaid Work	Paid Work	Unpaid Work	Paid Work
Has Partner	0.330** (0.132)	0.003 (0.050)	1.449*** (0.157)	-0.636*** (0.122)
Children	0.100 (0.092)	0.158** (0.066)	0.617*** (0.130)	-0.207** (0.076)
Number of Children	0.099*** (0.008)	-0.056** (0.025)	0.192** (0.071)	-0.048** (0.019)
Education (w.r.t. Less than Secondary)				
Secondary	-0.097 (0.143)	-0.002 (0.126)	-0.297** (0.139)	0.042 (0.122)
More than Secondary	0.023 (0.166)	0.061 (0.130)	-0.466** (0.171)	0.241** (0.090)
Employment (w.r.t. Full-Time Employed)				
Part-Time Employed	0.899*** (0.191)	-2.464*** (0.382)	1.434*** (0.210)	-2.484*** (0.338)
Not Employed	1.510*** (0.156)	-4.939*** (0.256)	2.732*** (0.199)	-5.132*** (0.233)
Observations	137,445	137,445	162,066	162,066
R ²	0.106	0.307	0.298	0.397

Source: Time use surveys for 18 advanced and emerging countries (Sample A).

Note: *** p<0.01, ** p<0.05, * p<0.10. Standard errors clustered at the country level. Regressions run separately for each group. Country fixed effects are included.

D. Recent Trends in Advanced Economies

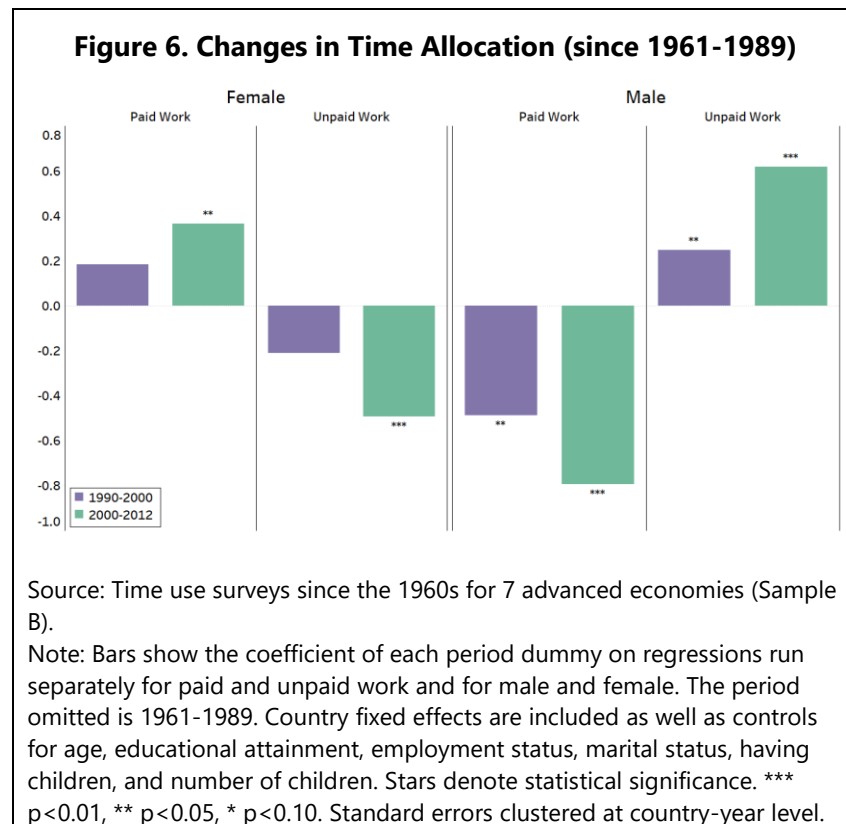
In this section, we exploit the fact that time use surveys for some advanced economies are available for multiple years to examine recent trends in time allocation. We use available time use surveys for 7 advanced economies, which have at least one survey in each of the following periods: 1961-1989, 1990-2000, and 2000-2012. We estimate the following specification separately for males and females, and for paid and unpaid work:

$$Time_{i,t} = \Phi Period_{i,t} + \kappa_c + \varepsilon_{i,t}$$

where i represents the individual and t is the year the survey was conducted. The vector of time dummies, $Period_{i,t}$, captures the average time trends given that no controls are included other than country-fixed effects. Standard errors are clustered at the country-year level. We choose to cluster at the country-year level because we only have 7 advanced economies with enough surveys to perform this exercise, the surveys are cross-sections and not panels of individuals, and, with the exception of the US in the 2000s, surveys were not run every year but instead there was

at least two (and usually five) years in between surveys, which alleviates any concerns about temporal correlation biasing the standard errors.^{6, 7}

Figure 6 presents changes in time allocation since 1961-89. Women are doing more paid and less unpaid work, while the opposite is true for men. In the 2000s, women, on average, spent half an hour less on unpaid work a day than women in 1961-1989. The decline was roughly matched by an increase in paid work. On the other hand, male paid work has declined, while time spent on unpaid work has risen by 40 minutes. These findings are consistent with the literature (e.g., Bick and others, 2018; Fang and McDaniel, 2017)



To further decompose this average time trend, we consider the evolution for subgroups defined in terms of civil status, employment, and education. We estimate the following specification separately for males and females for each subgroup:

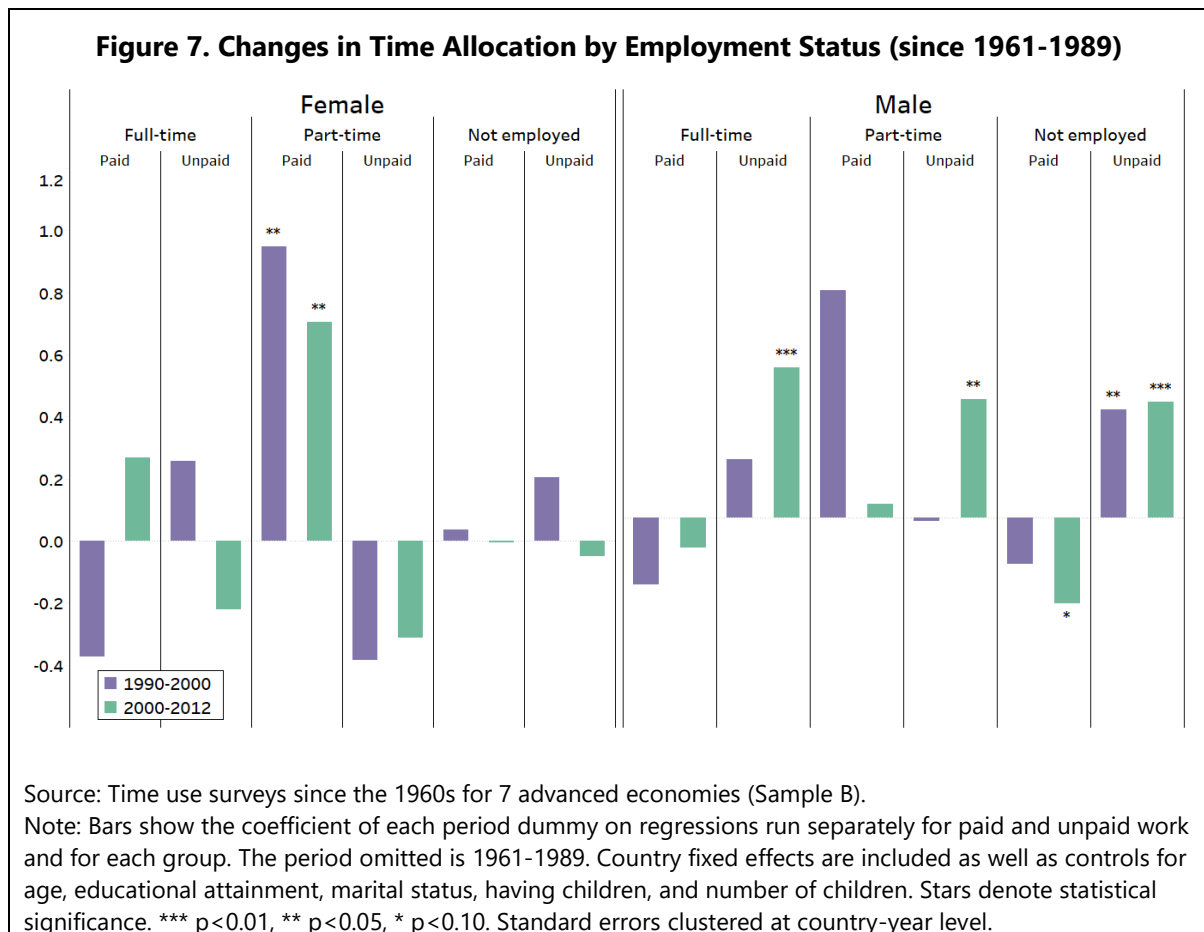
$$Time_{i,t} = \Phi Period_{i,t} + \Gamma X_{i,t} + \kappa_c + \varepsilon_{i,t}$$

⁶ Clustering at the country level increases the standard errors and reduces the statistical significance of some of the results, but our main results still hold. Results available upon request.

⁷ In robustness analysis, we also include a 'global financial crisis' dummy variable for the years 2007-09. Our estimates are largely unchanged. Results available upon request.

where i represents the individual, t is the year the survey was conducted, κ_c are country-fixed effects and $X_{i,t}$ is a vector of individual characteristics such as number of children, educational attainment, marital status and age. The vector of time dummies, $Period_{i,t}$, then captures the time trends for each subgroup. Standard errors are again clustered at the country-year level.

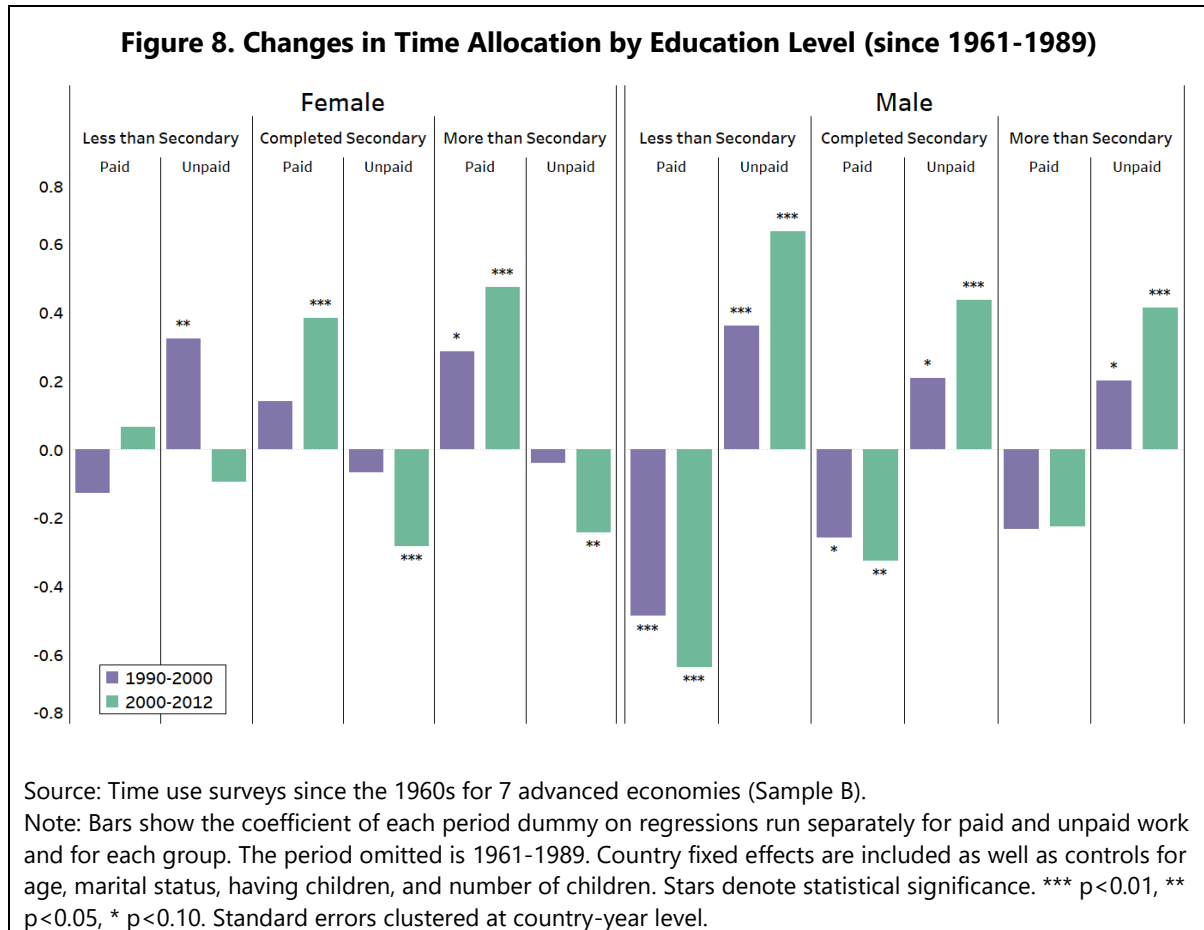
The redistribution of unpaid work has occurred within couples in advanced economies. While single men and women have not changed their time allocation, women with a partner have reduced their unpaid work and men with a partner contribute more to unpaid work now than in the past.⁸ Women employed part-time are doing less unpaid work and working more for pay (Figure 7). There is no significant change in time allocation for women employed full-time and those who are not employed. On the other hand, males irrespective of their employment status are doing more unpaid work, by around 20 minutes per day on average.



In advanced economies, educated women are working more for pay and doing less unpaid work (Figure 8). The tendency is greater for women with more than secondary education. The opposite

⁸ It is important to note that this is also driven by the increase in the share of single people in many advanced economies, which tend to do less unpaid work than people with partners.

holds for men. Unpaid work is increasing for all men, particularly more for those with less than secondary education. Paid work by men with secondary education or less is declining.



III. DRIVERS OF UNPAID WORK

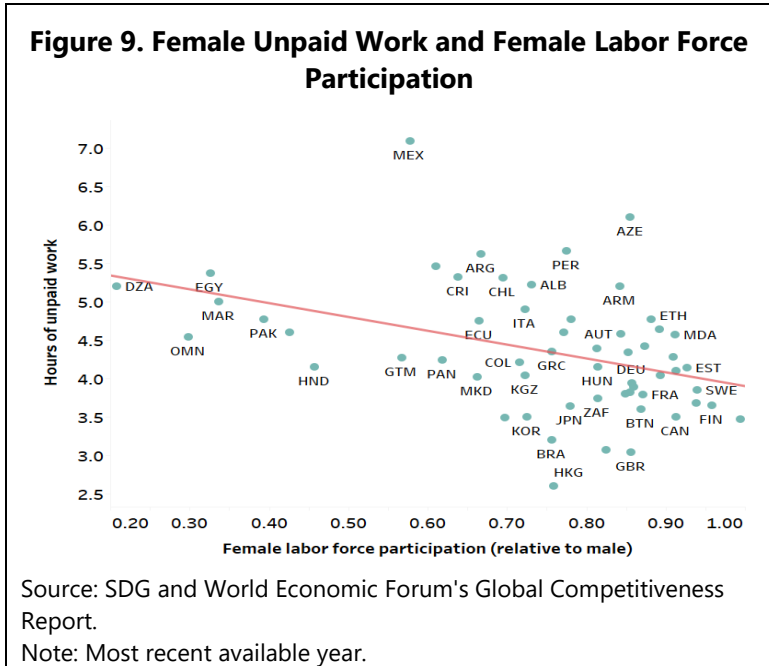
The unequal distribution of unpaid work between genders reflects a variety of considerations. In this section, we examine some of the drivers and correlates of unpaid work using cross-country regressions.

To systematically examine the drivers of unpaid work, we estimate the following specification separately for female and male unpaid work:

$$\log(\text{Time}_c) = \beta_0 + \beta_1 \log(\text{Driver}_c) + \beta_2 \log(\text{GDP per capita}_c) + \varepsilon_c$$

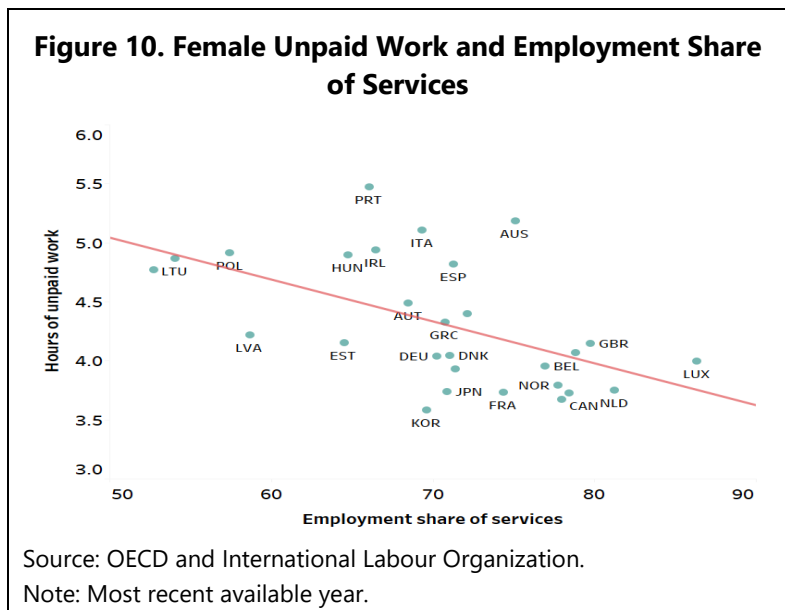
where Time_c is the average number of hours spent on unpaid work in country c and for different variables identified as potential drivers of unpaid work at the country level (Driver_c). The regression controls for GDP per capita in the country. Robust standard errors are used to infer statistical significance.

The immediate implication of unevenly distributed unpaid work is fewer hours available for women to work for pay. As can be seen from Figure 9, there is a negative correlation between female labor force participation rate and hours of unpaid work done by women in the aggregate, a correlation that is robust to controlling by GDP per capita.⁹ The relationship between female unpaid work and labor force participation is also likely to be related to the gender wage gap, though the causality needs to be tested.



Interestingly, the growing contribution by men to unpaid work in domestic chores in many advanced economies seems to be an important corollary of higher paid work by women.

The stage of the structural transformation in the economy also has implications for the observed patterns of unpaid work. The literature has found that economies with large agriculture and manufacturing sectors exhibit lower levels of female labor force participation. As the services sector expands, female labor force participation increases (Alvarez, 2019; Ngai and Petrongolo, 2017). As seen in Figure 10, the expansion of the services sector with the marketization of production is associated with a decline in female unpaid work.

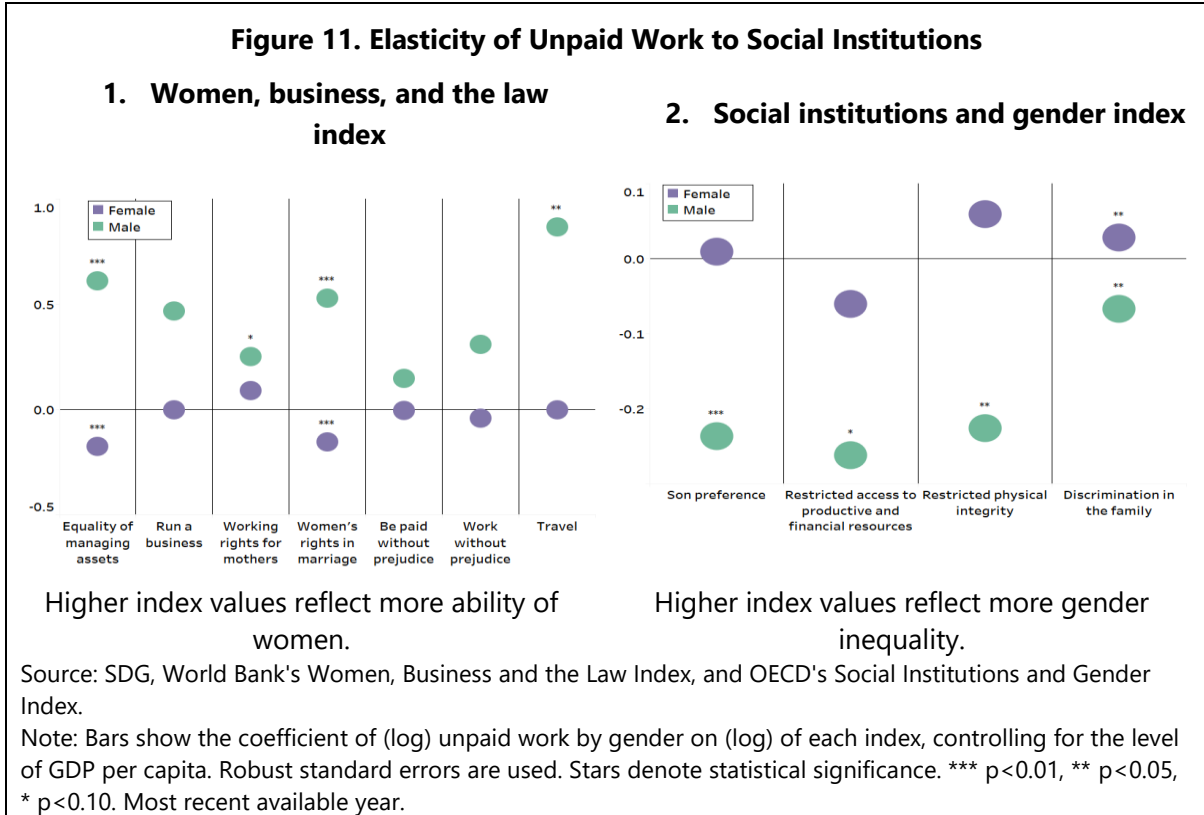


⁹ We estimate the elasticity of unpaid work to female labor force participation to be -0.198 and 0.689 for females and males, respectively. Both are statistically significant at the 1 percent level and correspond to a sample of 57 economies.

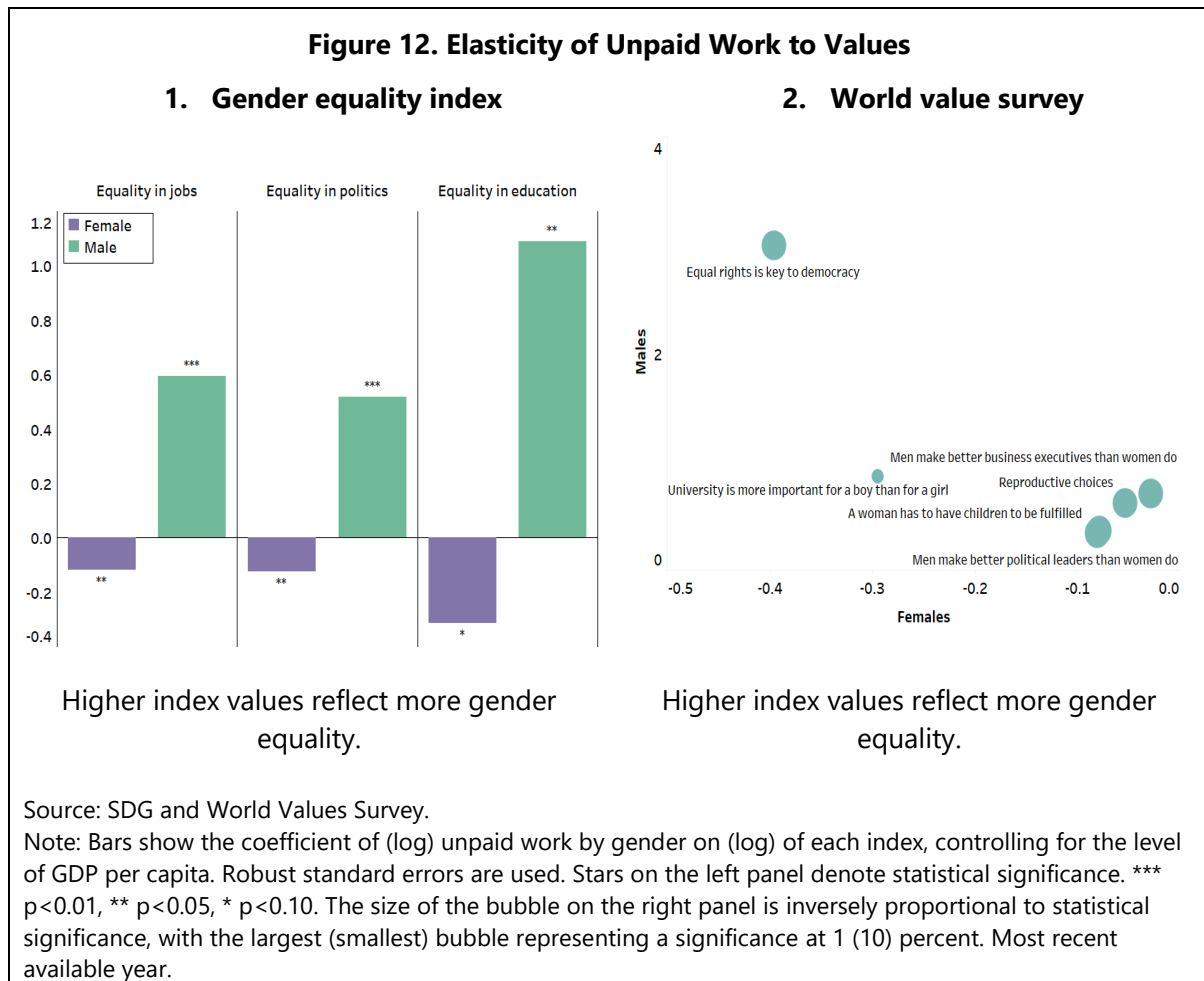
Higher fertility is associated with more unpaid work. As shown in the regression results reported in Table 1, women with children spend 37 more minutes on unpaid work than women without children. The time spent on unpaid work increases by 12 minutes, on average, per child. These estimates are statistically significant. Men with children also increase their time spent on unpaid work, spending on average 6 minutes more on unpaid work per additional child. Cross-country regressions confirm this result with female unpaid care work increasing significantly with higher fertility rates, even after controlling for the level of development of a country. The elasticity of female unpaid work to the fertility rate is 0.457 and statistically significant at the 1 percent level in a sample of 69 economies (results available upon request). The elasticity is 23 percent smaller and not statistically significant for male unpaid care work.¹⁰

Social institutions can constrain reallocation of unpaid work preventing men from contributing (Figure 11). We show this by examining the association between unpaid work and two different measures of social institutions in the context of gender compiled by the World Bank (the women, business, and the law index) and the OECD (the social institutions and gender index). Women do significantly less unpaid work in societies where there is stronger equality in managing assets and where women's rights in marriage are stronger, conditional on the level of economic development. On the other hand, the weaker the ability of women to engage in business, work, and manage wealth, the less unpaid work is performed by men. Similar results are obtained when using the social institutions and gender index compiled by the OECD. Societies with more gender inequality experience significantly less unpaid work by men. These results are in line with the negative impact of unequal laws on female labor force participation found by Gonzales and others (2015).

¹⁰ Migration inflows of low-skilled workers may help women participate in the labor market as the cost of purchasing domestic chores and care work becomes cheaper (Peri, 2014).



Values and perceptions also matter for redistributing unpaid work between men and women (Figure 12). Social and cultural attitudes toward women's role in society can also influence employment decisions (Ichino and others, 2019). Women may be discouraged from doing paid work as it may cause disutility to her or her family in society. In this case, the decision to do unpaid work at home could be considered as individual "preference," although it may not be voluntary. We use metrics from the World Value Survey to proxy for those attitudes using gender equality indexes (see also Welzel, 2013) and the shares of the country's population that agree with certain statements. We find that unpaid work is less unevenly distributed in societies that place lower value on gender equality in jobs, politics, and education, conditional on the level of economic development. Male unpaid work is also higher in societies where more people consider equal rights key to democracy or disagree with statements such as "men make better business executives than women do," "men make better political leaders than women do," or "a woman has to have children to be fulfilled."



IV. POLICIES TO REDUCE AND REDISTRIBUTE UNPAID WORK

Inequality in unpaid work reflects the childbearing ability of women, voluntary choices, as well as constraints imposed by cultural norms. But, as described in this section, policies can reduce and redistribute unpaid work. In many economies, men now spend more time on unpaid work than in the past, which has also freed up women to increase their labor force participation. For women considering entering the labor market, a number of factors are of relevance:

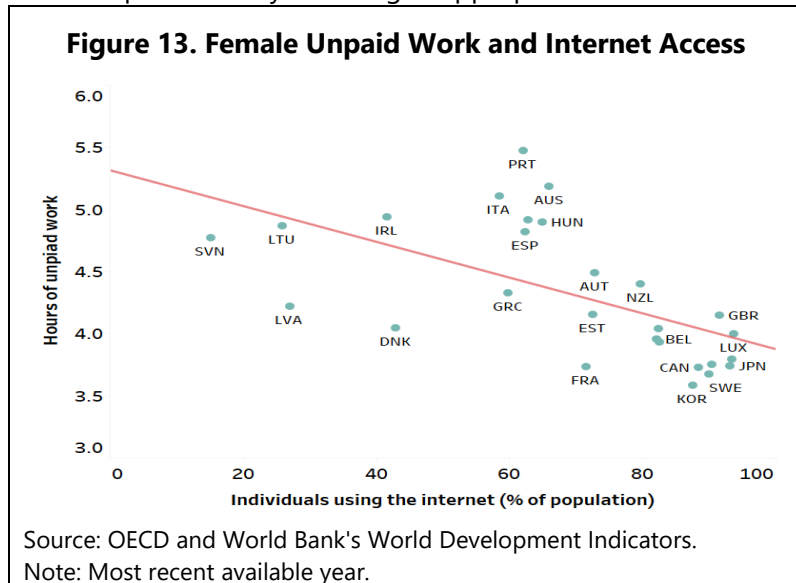
- Women will assess the expected return to unpaid work and that to paid work by comparing the costs and benefits of each type of work, which will depend on both individual and household factors such as educational attainment, a history of past occupation, household structure, as well as the enabling environment created by policies.
- Policies to address specific challenges faced by women and households can affect the decision to join the labor force and make it possible to stay in the labor market. For instance, provision of childcare and family-friendly policies with flexible work arrangements help women join and stay in the labor force.

- Labor market programs, institutions, and non-economic factors can also play a role in determining how much unpaid work will be done. Tax policies can directly affect individuals' incentives to participate in the labor market and shape labor demand by affecting labor costs faced by firms. Active labor market policies can support job applicants in finding employment and prevent people from becoming permanently detached from the labor force.

Governments can relieve the burden of unpaid work by investing in appropriate infrastructure

and public services. In particular, investments in water, sanitation, electricity, and transport are critical in developing countries to allow for the "engines of liberation" that enable women to spend less time doing very low-productivity tasks (e.g., fetching water or performing other domestic household tasks (Greenwood and others, 2005; Cubas, 2016; Ilahi and Grimard, 2000)). Provision of adequate security services is

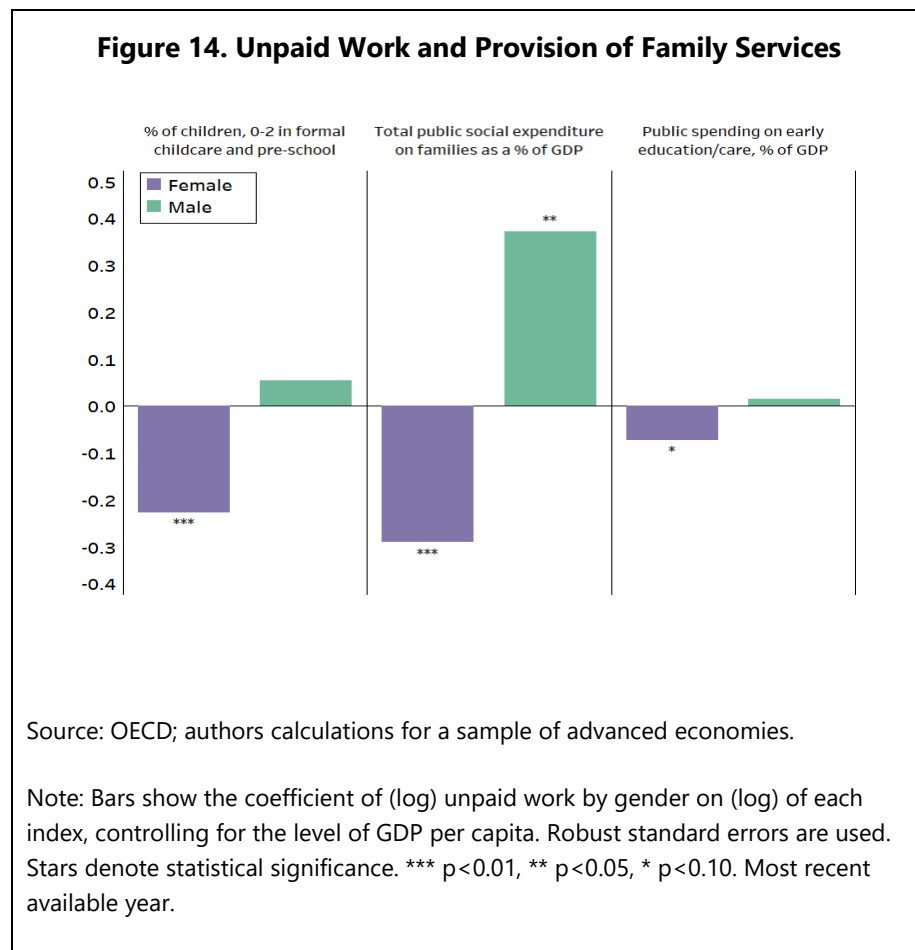
also important to ensure that women can travel to and from work or school safely, while provision of health and education guarantees accumulation of women's human capital.¹¹ These policies have been found to have a significant effect on narrowing gender gaps in labor force participation (Jain-Chandra and others 2018). Investments in digital infrastructure to foster access to internet can also reduce unpaid work. As shown in Figure 13, even controlling for the level of economic development, women in countries with higher internet access spend significantly less time on unpaid work.¹² Investments in digital infrastructure may become even more important in the future as the gig economy continues to expand.



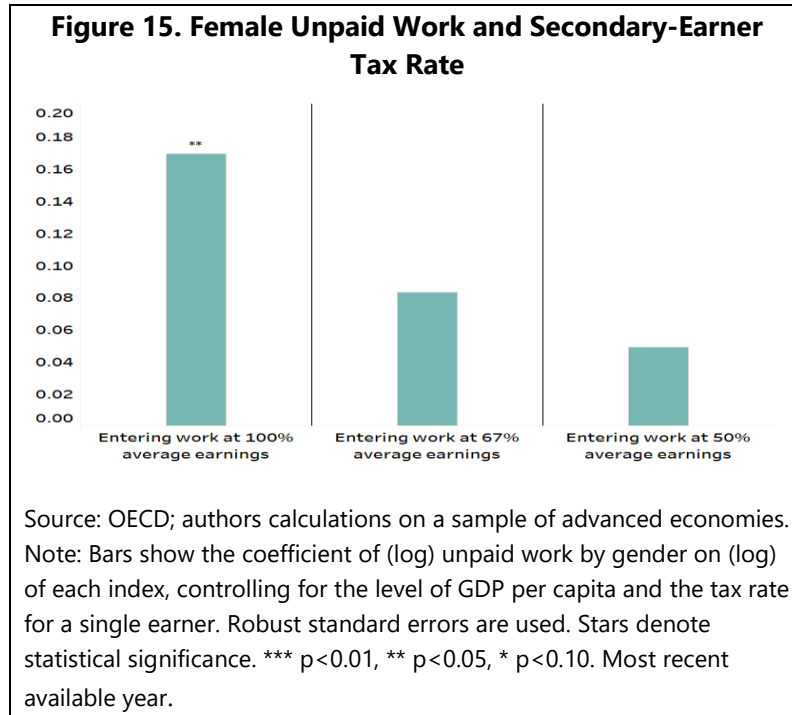
¹¹ Gender gaps in education persist in many developing and emerging markets (Jain-Chandra and others, 2018). Public spending on education can help narrowing them down and boosting female labor force participation. The gender gap in STEM remains also in many advanced countries (WEF, 2017).

¹² The elasticity of female unpaid work to internet access is -0.102 and statistically significant at the 10 percent level in a sample of 27 economies.

Unpaid work can also be reduced by providing child and elderly care. Controlling for the level of economic development, countries where more young children are enrolled in formal care and where there is higher public spending on families and on early education exhibit lower unpaid work by women (Figure 14). This is in line with previous findings in the literature, which show that better access to affordable quality childcare frees up women's time for formal employment (Gonzales and others, 2015).



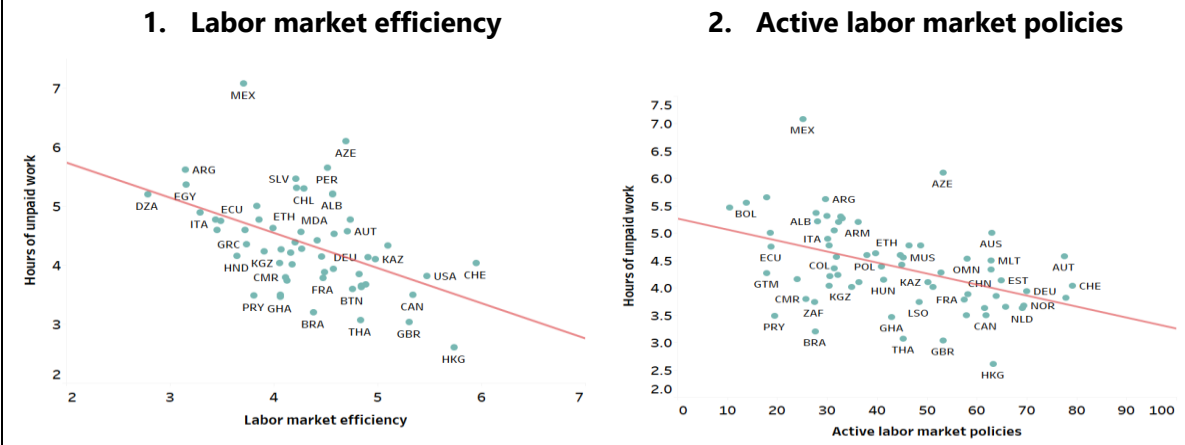
High tax rates for secondary earners discourage labor force participation and raise women's unpaid work (LaLumia, 2008; Feldstein and Feenberg, 1996). When the tax system has features that encourage couples to file taxes jointly, the secondary earner, who typically tends to be a woman, ends up paying a much higher marginal tax rate than if the returns are filed separately. This discourages female labor force participation. Indeed, we find that higher secondary earner tax rates lead to higher unpaid work by women after controlling for GDP per capita and the tax rate for a single earner (Figure 15). This impact is stronger the higher the expected earnings of the secondary earner.



Efficient labor markets contribute to reducing female unpaid work (Figure 16). Active labor market programs can facilitate job matching and help retain women in the labor market. Better labor regulations and efficiency also contribute to reducing women's unpaid work. Higher wage gaps, on the other hand, encourage women to do more unpaid work, suggesting that the lack of "equal pay for equal work" creates disincentives for women to engage in paid work.

Family-friendly policies make it easier for women to combine paid work and child care (Figure 17). Parental leave for both men and women and family leave to care for sick dependents can help women participate in the labor market. While the length of maternity leave does not seem to affect time spent on paid work by men, both maternity and paternity leaves foster women's paid work. This is consistent with findings in the literature (Olivetti and Petrongolo, 2017).

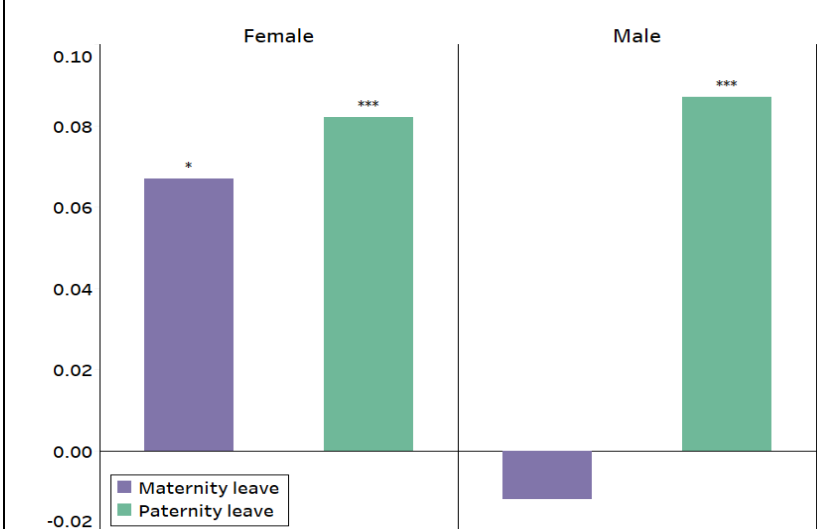
Figure 16. Female Unpaid Work and Labor Markets



Source: SDG and World Economic Forum's Global Competitiveness Report and Global Competitiveness Index 4.0.

Note: Most recent available year. "Labor market efficiency" is the weighted score of different metrics that the Global Competitiveness Report associates with efficient labor markets, is the 7th pillar of their competitiveness index. "Active labor market policies" corresponds to responses to the question "in your country, to what extent do labor market policies help unemployed people to reskill and find new employment (including skills matching, retraining, etc.)?"

Figure 17. Paid Work and Parental Leave Policies



Source: OECD; authors calculations on a sample of advanced economies.

Note: Bars show the coefficient of the log of unpaid work by gender on the log of each variable, controlling by the level of GDP per capita. Robust standard errors are used. Stars denote statistical significance. *** p<0.01, ** p<0.05, * p<0.10. Most recent available year.

Extended maternity leave may have a negative effect on female labor outcomes by keeping women outside of the labor force for longer periods when their skills may depreciate, exacerbating the “motherhood penalty” (Ruhm, 1998; Kleven and others, 2019). Instead, it may be preferable to encourage greater parity between paternity and maternity leave (Elborgh-Woytek and others, 2012). In addition, longer periods of paternity leave can increase male contribution of care work even after the leave period and reduce the within-household gender wage gap (Fernández-Cornejo and others, 2018; Andersen, 2018).

Flexible work arrangements also help redistribute unpaid work between men and women (Table 2). In this respect, the government as well as businesses and trade unions can play a role in changing the organization of paid work to better balance work and family.

	Unpaid Work		Paid Work	
	Female	Male	Female	Male
<i>% of female employees that can...</i>				
Work from home more than several times a week	-0.105	0.136	0.167	0.045
Work from home several times a month	-0.141***	0.230***	0.079	-0.049
Work from home less than several times a month	-0.156***	0.176***	0.174*	0.024
Never work from home	0.552***	-0.783***	-0.499	0.055
Employees have some ability to set schedule	-0.187***	0.310***	0.080	-0.091
Working hours set by company	0.346***	-0.527***	-0.230	0.093
Employees choose a between set schedules	-0.150*	0.131	-0.074	-0.097
Employees set schedules within limits	-0.135***	0.263***	0.074	-0.078
Employees determine working hours	-0.104**	0.146*	0.079	0.015
<i>% of male employees that can...</i>				
Work from home more than several times a week	-0.076***	0.078*	0.141**	0.057
Work from home several times a month	-0.108**	0.226***	0.072	-0.087
Work from home less than several times a month	-0.210***	0.258***	0.156	-0.076
Never work from home	0.550***	-0.814***	-0.451	0.162
Employees have some ability to set schedule	-0.218***	0.349***	0.142	-0.062
Working hours set by company	0.348***	-0.506***	-0.219	0.107
Employees choose a between set schedules	-0.074	0.111	-0.084	-0.161***
Employees set schedules within limits	-0.119***	0.179*	0.047	-0.048
Employees determine working hours	-0.156***	0.165**	0.136*	-0.003

Source: OECD; authors calculations based on a sample of advanced economies.
Note: Each cell shows the coefficient of the log of each time use category by gender on the log of each variable, controlling by the level of GDP per capita. Robust standard errors are used. Stars denote statistical significance. *** p<0.01, ** p<0.05, * p<0.10. Most recent available year.

V. A MODEL-BASED QUANTIFICATION OF THE GAINS OF REDUCING AND REDISTRIBUTING UNPAID WORK

To quantify the economic effects of policies geared towards reducing women's burden of unpaid work and increasing their labor force participation, we adapt a model of structural transformation and marketization of home production by Ngai and Petrongolo (2017). The key elements of the model are differential productivity growth rates for unpaid home and paid market sectors, which induce labor to move out of home production to join more productive market sectors. In particular, the model emphasizes the role of the rising services sector, where women have a comparative advantage relative to men, in absorbing female labor moving out of the home sector. We calibrate the model to the case of 18 advanced and emerging economies to study the effects of lowering barriers to women's participation in the paid market sector.

Paid market sector

The model features two market sectors—goods ($j=g$) and services ($j=s$)—where firms produce output using the following technology:

$$Y_{ji} = A_{ji} \left[\xi_{ji} L_{fji}^{\frac{\eta-1}{\eta}} + (1 - \xi_{ji}) L_{mji}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, j = g, s.$$

L_{fji} and L_{mji} denote female and male labor inputs in production. Sectoral productivity parameters, A_{ji} , vary across countries i to capture countries' level of development. Country-specific parameters, ξ_{ji} , capture women's comparative advantage in a given sector and η is the elasticity of substitution between female and male labor.

Barriers to female participation in paid work are represented by a wedge that lowers female wages relative to their output in the market sector. From the first order conditions, we obtain the following relationship between the gender wage ratio and the marginal rate of technical substitution:

$$\frac{w_{fi}}{w_{mi}} = \frac{\beta_{ji} \xi_{ji}}{1 - \beta_{ji} \xi_{ji}} \left(\frac{L_{mji}}{L_{fji}} \right)^{\frac{1}{\eta}},$$

where the wedge parameter $\beta_{ji} < 1$ represents policies or a lack thereof that serve as barriers to female labor force participation and thus raise their hours of unpaid work.

Unpaid home sector

Household's joint utility depends on consumption of goods and services produced on the market (c_{gi} and c_{si}), services produced at home (c_{hi}), and leisure (L_{li}):

$$U(c_{gi}, c_{si}, c_{hi}, L_{li}) = \ln c_i + \phi \ln L_{li}.$$

c_i is a composite consumption of good and services:

$$c_i = \left(\omega_i c_{gi}^{\frac{\epsilon-1}{\epsilon}} + (1 - \omega_i) c_{zi}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}}; \quad c_{zi} = \left(\alpha_i c_{si}^{\frac{\sigma-1}{\sigma}} + (1 - \alpha_i) c_{hi}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

where c_{zi} is a CES aggregator of market- and home-produced services.

Home services are produced using female and male labor:

$$c_{hi} = A_{hi} \left[\xi_{hi} L_{fhi}^{\frac{\eta-1}{\eta}} + (1 - \xi_{hi}) L_{mhi}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}},$$

and household leisure is a composite of female and male leisure time:

$$L_{li} = \left[\xi_{li} L_{fli}^{\frac{\eta_l-1}{\eta_l}} + (1 - \xi_{li}) L_{mli}^{\frac{\eta_l-1}{\eta_l}} \right]^{\frac{\eta_l}{\eta_l-1}}.$$

Finally, the household's budget constraint is defined as:

$$p_{gi} c_{gi} + p_{si} c_{si} = w_{fi} (L_{fi} - L_{fhi} - L_{fli}) + w_{mi} (L_{mi} - L_{mhi} - L_{mli}).$$

Definition of the model's equilibrium is analogous to Ngai and Petrongolo (2017).

Calibration

We calibrate the baseline model to 18 countries (Austria, Chile, Ecuador, Estonia, Finland, France, Hungary, Italy, Japan, Mexico, Netherlands, Norway, New Zealand, Pakistan, Panama, South Africa, United Kingdom, and United States). We derive country-specific parameters using the following data moments: (i) home and market production hours by gender from Bridgman and others (2018) and national time use surveys; (ii) working-age population and employment in goods and services by gender from the World Bank's World Development Indicators database and ILOSTAT; (iii) gender wage gap data from ILOSTAT; and (iv) value added by sector from the World Bank's World Development Indicators database and Bridgman et al. (2018).¹³ Gender elasticity parameters, η and η_l , are set to the values calibrated in Ngai and Petrongolo (2017) for the United States.

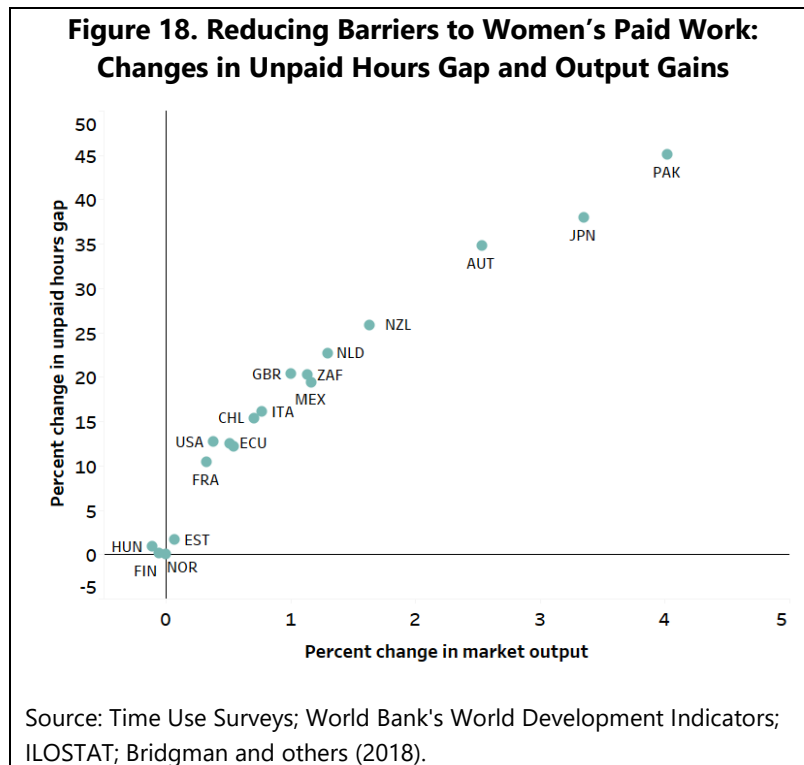
To assess the role of reducing the barriers to women's participation in paid employment (raising the value of β_i), we choose Norway as a benchmark country as it has one of the lowest gender gaps in the hours of unpaid work and wages. β_i is set to unity in the case of Norway and calculated as a ratio of wage gaps relative to Norway's wage gap for all other countries. In the

¹³ All calibrated model parameter values are available upon request.

counterfactual scenario, we set β_i to unity and recalculate equilibrium wages and labor allocations.

Counterfactual scenario results

Removing barriers to female labor force participation reduces the number of hours women spend in home production and increases men's participation in home production, thus lowering the gender gap in total hours of unpaid work (Figure 18, y-axis). In Pakistan, the gap in unpaid work is 45 percent lower in the counterfactual scenario, while in Mexico, South Africa, and United Kingdom, the gap declines by about 20 percent.



Our findings show that some countries can substantially benefit from policies that reduce women's barriers to participating in paid employment (Figure 18, x-axis). Gains are not distributed equally across countries and largely depend on the initial level of gender inequality in the total hours of unpaid work. Countries with the largest gender gaps in unpaid work, such as Pakistan and Japan, can gain between three and five percent of additional output by removing these barriers. On the other hand, countries with relatively low unpaid hours gaps like Estonia, Finland, and Hungary would benefit little in this counterfactual scenario, being already close to the benchmark country Norway in terms of the gender hours gaps. These estimates are more conservative than those in the literature (Alvarez, 2019; Ostry and others, 2018) due to differences in model assumptions and greater granularity in the calibration approach and thus

should be interpreted with caution.¹⁴ Changing the assumptions on the barrier parameter β_i and adjusting the calibration strategy to more closely match the estimates in the literature could yield output gains in the order of 7 to 11 percent for the least gender-equal countries in our sample.

In the counterfactual scenario, we isolate the forces of structural transformation and marketization behind the rising services sector and focus solely on labor reallocation following removal of the wedge on women's relative wages.¹⁵ However, growth in service sector productivity (i.e., due to improvements in child care infrastructure, investment in health and education) relative to home production would further promote reallocation of female labor away from unpaid work since women have a comparative advantage in the service sector. Service sector growth, however, impacts female and male labor force participation differently. Whereas marketization of home-produced services due to new technologies have a larger positive impact on women's paid hours of work, reallocation of labor from the more productive manufacturing sector to less productive service sector has a larger negative effect on men's hours of paid work.¹⁶ Thus, income growth and broader structural policies boosting productivity of the service sector can accelerate the process of marketization and significantly reduce gender gaps in employment and wages.

VI. CONCLUSIONS

Unpaid work is a substantial part of economic activity that goes unmeasured and is shouldered disproportionately by women. While gender imbalances in unpaid work have declined in recent decades, they remain significant. Even in the most egalitarian countries in the world, women do at least 20 percent more unpaid work than men, with the vast majority of unpaid work comprised of domestic chores rather than care work. The burden of female unpaid work declines as countries develop with engines of liberation and marketization of the economy reducing the amount of unpaid work and allowing female labor force participation to rise. Social institutions and values also matter for reducing and redistributing unpaid work.

There are large gains to be reaped from reducing and redistributing unpaid work. Governments can help by investing in infrastructure and public services such as water, electricity, and security

¹⁴ Alvarez (2019) and Ostry and others (2018) calibrate the model parameters for a larger set of countries, with a larger number of the model parameters to the United States' estimates. We follow the calibration technique in Ngai and Petrongolo (2017) more closely and match a complete set of data moments for all the individual countries in our sample.

¹⁵ Sectoral productivity growth differentials are calibrated for each country based on sectoral value-added data from Bridgman and others (2018) and World Bank World Development Indicator databases. However, productivity levels are unchanged between the baseline and counterfactual scenario, so as to isolate the effect of removing the wedge on the relative wages. Thus, structural transformation forces do not affect labor allocation across sectors.

¹⁶ In the case of the US, men have shifted their paid work hours towards more leisure hours in the process of structural transformation (Aguilar and others, 2018).

in developing countries and digital connectivity everywhere can help reduce unpaid work. Fostering the provision of childcare and elderly care can replace unpaid work with paid work. Redistribution of unpaid work also requires investing in women's human capital through education and health care, enshrining women's rights in the law, implementing family-friendly policies such as parental leave and taxation of secondary earners, enhancing the efficiency of labor markets, and promoting flexible work arrangements.

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APPENDIX: DATA SOURCES

A. Time Use Averages

Time use averages by country are available for two sources: the SDGs Gender Indicators and the OECD time-use surveys. For simplicity, in the text we refer to these datasets as SDG and OECD, respectively. Because coverage of covariates varies significantly, we use these databases selectively depending on the question we ask and availability of other data. The SDG covers both developing and advanced economies, whereas the OECD dataset includes mostly advanced economies.

The SDG Gender Indicators includes the average number of hours spent on unpaid work by gender. It also disaggregates unpaid work into domestic chores and care work. Unpaid domestic chores include food preparation, dishwashing, cleaning and upkeep of the dwelling, laundry, ironing, gardening, caring for pets, shopping, installation, servicing and repair of personal and household goods. Unpaid care work includes childcare, and care of the sick, elderly or disabled household and family members. Both categories also include traveling associated to the tasks.

Data is compiled to monitor attainment of Target 5.4 (Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate) as part of Goal 5 (Achieve gender equality and empower all women and girls). The data is available for 90 countries. For some countries there are multiple observations in the period 2000 to 2017, but for many countries there is only one datapoint.

The OECD also provides average number of hours spent on different activities by gender. The breakdown includes unpaid work, paid work, leisure, personal care, and other. It covers 28 OECD countries.

B. Time Use Surveys

We complement the multinational time use study (MTUS) with microdata for three other emerging countries. MTUS provides harmonized time use surveys for 23 countries with consistent time use variables and characteristics of the individual and the household such as gender, employment status, education, marital status, and family size. We complement the MTUS dataset with the "Time Use Survey 2007" for Pakistan, the "Encuesta Nacional de Uso del Tiempo 2014" for Mexico, and the "Encuesta Nacional de Uso del Tiempo 2015" for Chile. For full details on the processing of the microdata, please refer to Fisher and Gershuny (2016). We aggregate the categories of time use provided by MTUS into paid work or study, unpaid work, personal care, leisure, and other.

We consider two samples for our microdata analysis. Sample A covers the 18 countries but uses only the most recent time use survey for each country and excludes any country whose most recent time use survey is from before 2000. Sample B is used to study time trends. To that end, we keep countries with time surveys in the different periods under analysis. Thus, we restrict the

analysis to Canada (7 surveys), Finland (4 surveys), France (5 surveys), Netherlands (7 surveys), Norway (4 surveys), United Kingdom (7 surveys), and United States (16 surveys).

C. Other Variables

Other variables are obtained from the following datasets:

Variable	Source
A woman has to have children to be fulfilled	The World Values Survey
Ability of women to be paid without prejudice	The World Bank's Women, Business and the Law Index
Ability of women to run a business	The World Bank's Women, Business and the Law Index
Ability of women to travel	The World Bank's Women, Business and the Law Index
Ability of women to work without prejudice	The World Bank's Women, Business and the Law Index
Active labor market policies	The World Economic Forum's Global Competitiveness Index 4.0
Discrimination in the family	The OECD's Social Institutions and Gender Index
Employees choose a between set schedules	The OECD's Family Database
Employees determine working hours	The OECD's Family Database
Employees have some ability to set schedule	The OECD's Family Database
Employees set schedules within limits	The OECD's Family Database
Equal rights are key to democracy	The World Values Survey
Equality of managing assets	The World Bank's Women, Business and the Law Index
Female labor force participation	The World Economic Forum's Global Competitiveness Report
Fertility rate, total (births per woman)	The World Bank's World Development Indicators
GDP per capita, PPP (constant 2011 international \$)	The World Bank's World Development Indicators
Gender equality in education	The World Values Survey based on Welzel (2013)
Gender equality in jobs	The World Values Survey based on Welzel (2013)
Gender equality in politics	The World Values Survey based on Welzel (2013)
Husband and wife should both contribute to income	The World Values Survey
Individuals using the Internet (percentage of population)	The World Bank's World Development Indicators
Labor market efficiency	The World Economic Forum's Global Competitiveness Report

Length of paid maternity and parental leave for mothers in weeks	The OECD's Family Database
Length of paid paternity and parental leave for fathers in weeks	The OECD's Family Database
Men make better business executives than women do	The World Values Survey
Men make better political leaders than women do	The World Values Survey
Never work from home	The OECD's Family Database
Percentage of children aged 0-2 in formal childcare and pre-school	The OECD's Family Database
Public spending on early education/care as a percentage of GDP	The OECD's Family Database
Reproductive choices	The World Values Survey
Restricted access to productive and financial resources	The OECD's Social Institutions and Gender Index
Restricted physical integrity	The OECD's Social Institutions and Gender Index
Share of employment in services	The International Labour Organization
Son preference	The OECD's Social Institutions and Gender Index
Tax rate entering work at 100% of average earnings, with 2 children, 1 partner earning 67% of the average	The OECD's Family Database
Tax rate entering work at 50% of average earnings, with 2 children, 1 partner earning 67% of the average	The OECD's Family Database
Tax rate entering work at 67% of average earnings, with 2 children, 1 partner earning 67% of the average	The OECD's Family Database
Total public social expenditure on families as a percentage of GDP	The OECD's Family Database
Women's rights in marriage	The World Bank's Women, Business and the Law Index
Work from home less than several times a month	The OECD's Family Database
Work from home more than several times a week	The OECD's Family Database
Work from home several times a month	The OECD's Family Database
Working hours set by company	The OECD's Family Database
Working rights when having children	The World Bank's Women, Business and the Law Index