Socioeconomic Impact of Unpaid Care and Domestic Work in Ethiopia

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Abstract

In Ethiopia, as in many parts of the world, unpaid care and domestic work constitute a significant but often overlooked component of the economy, impacting the achievement of Sustainable Development Goals (SDG). Despite its critical role in the support of families and communities, unpaid care and domestic work are often undervalued and are not adequately represented in economic analyses, contradicting principles outlined in the SDG 5.4 on recognizing and valuing unpaid care. Thus, this study investigates how unpaid care and domestic work affect the time allocation for leisure, personal care, how unpaid care, and paid economic activities. The study used Ethiopian Time Use Survey (ETUS) data, as it provides a unique opportunity to explore the socioeconomic impact of unpaid work activities, shedding light on their contribution to both individual well-being and national economic development. The study used a two-stage least squares (2SLS) as an analysis tool to identify how unpaid work affects nonproductive and productive activities. The finding shows that unpaid care and domestic work significantly reduce individual time spent on leisure or nonproductive activities, such as attending cultural events, participating in hobbies or relaxing. Similarly, unpaid care and domestic work significantly reduce the amount of time spent on productive or paid activities. Furthermore, age, sex, and the presence of children under 6 years of age significantly influence the time spent on nonproductive and productive activities. The findings highlight the interplay of age, gender, and unpaid work in shaping nonproductive/productive time use.

Keywords: Unpaid care and domestic work, Time use, Socio-economic impact, Ethiopia

Introduction

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Unpaid Care and Domestic Work (UCDW) constitutes a critical economic concern for several reasons. Primarily, unpaid care and domestic activity (here after unpaid work) have been considered as life-sustaining activity for individuals and/or households with no direct remuneration (Oxfam Policy Brief, 2020). Despite contribute up to 13% of global GDP, these activities (such as domestic work and child care) remain unaccounted for and unrecognized in official economic measurements (ILO, 2024). Second, unpaid work is unequally distributed by gender, with women's shouldering the main burden. This disparity represents a significant impediment to achieving the Sustainable Development Goals (SDGs)(Hirway, 2015). Globally women spend 35% to 50% of their time in domestic care activities per day, compared to only 4% to 10% for men (Antonopoulos, 2009;ILO, 2018). Furthermore, women perform more than 75% of the world's unpaid care and domestic work. An ILO report starkly estimated that it would take at least 200 years to close the gender gap in unpaid work (Addati et al., 2018). The disproportionate burden of unpaid care and domestic work represents a fundamental infringement on women's human rights, a significant barrier to equitable and sustainable development, (Hirway, 2015), and directly undermines progress towards gender equality (SDG 5) and broader inclusive development.

Historically, mainstream economic theories have overlooked UCDW. Classical, neoclassical, and Kuznetsian economic frameworks, for instance, define production narrowly through market-traded jobs, excluding unpaid work due to its lack of market value. However, scholars around the world recently argued that the conventional measure of well-being is not adequate in measuring the household standards of living (Antonopoulos, 2009; Antonopoulos et al., 2012; Hirway, 2015; Oxfam Policy Brief, 2020; Rania Antonopoulos & Hirway, 2010). For instance, Antonopoulos et al., (2012) acknowledged that basic needs are fulfilled based on three channels: commodities purchased from the market, public and social services provided by the state, and dedication of time to unpaid work to transform the commodity into consumable goods.

The allocation of unpaid work is heavily skewed toward women, a disparity largely attributable to established social norms and patriarchal values (Oxfam Policy Brief, 2020). This exclusion not only diminishes women's contributions but also results in their social and economic marginalization from the market and mainstream economy. It is a *de facto* segregation of women in the economy (Antonopoulos, 2009; Hirway, 2015). More importantly, this inequality significantly undermines the progress towards the SDGs, and poverty levels would be worse than the existing level if women's deprivation due to unpaid work were taken into consideration in poverty measurement (Antonopoulos et al., 2012). A study in Kenya, for instance, revealed a strong association between urban poverty and increased care workloads (Hall & Vincent Aranas, 2013). Therefore, unpaid work not only affects its contribution to its economy but also diverts attention to its socioeconomic impact.

In Ethiopia, UCDW has a profound impact on socioeconomic development and gender equality. Women and girls provide millions of hours of unpaid work annually, constituting a fundamental yet undervalued pillar of the economy (Oxfam Policy Brief, 2020). In Ethiopia, women spend an average of 13 hours a day on domestic care work. Furthermore, Ethiopian women are twice as likely as men to spend time collecting water and firewood (CSA, 2014). This unequal distribution of unpaid work creates barriers to sustainable development and stalls progress on multiple Sustainable Development Goals. Moreover, the burden of unpaid work on women significantly constrains women's opportunity to participate in decent paid employment, education, leisure, and political life, trapping many in a cycle of poverty (Hall & Vincent Aranas, 2013). According to ILO (2024), unpaid work is the main reason for 42% of women being out of the paid workforce, compared to only 6% of men. The persistence of traditional expectations, where men are often seen as the breadwinners and women are primary caregivers, regardless of their paid employment status, perpetuates this issue, especially where care infrastructures are limited (Oxfam Policy Brief, 2020). Time use data analysis from Ethiopia and other countries emphasizes the importance of recognizing, reducing, and redistributing unpaid care work to promote women's economic empowerment (Ferrant & Thim, 2019). Gender inequality in Ethiopia affects various aspects of socioeconomic development, including health, fertility control, and access to resources, with rural women particularly vulnerable to poverty and time poverty (Dula, 2019; Kedir & Rodgers, 2018; Mezmur et al., 2017).

In Ethiopia, where care infrastructures are limited and deeply ingrained societal norms dictate a gendered division of labor unpaid work, the impact of unpaid care and domestic work is immense and extends beyond what can easily be measured. The specific impact of UCDW on gendered time allocation for both leisure and paid work has not been thoroughly investigated. Thus, this study aims to investigate the socioeconomic impact of unpaid care and domestic care in Ethiopia by addressing two specific objectives: first, to analyze its effect on time allocated for leisure activities (including hobbies, games, sports, and personal care); and second, to examine its impact on participation and time spent on paid activities. By analyzing these relationships, this research sheds light on how UCDW affects personal well-being and has broader implications for labor market participation, social engagement, and economic productivity. Therefore, the findings will provide essential, localized data that directly inform progress towards SDG Target 5.4, which emphasizes recognizing, valuing and redistributing unpaid care work.

Method and Material

Data

This research utilizes data from the 2013 Ethiopian Time Use Survey (ETUS) collected by the Ethiopian Statistical Service (ESS). The ETUS is the only data source in the country

considered rational to count participation, as well as time spent on unpaid care and domestic work. Our research project, which focuses on socioeconomic impact of unpaid care and domestic work in Ethiopia, has been made possible through funding from the Network of Ethiopian Women Associations (NEWA). As part of this collaborative effort and adherence to ethical research practices, the Ethiopian Statistical Service (ESS) officially shared the required data with our research team, following a formal request and an official letter from the NEWA.

The ETUS, which was the nationally representative survey covered 20,122 households (14,009 rural and 6113 urban), and collected information from 52,262 individuals aged 10 years and older, using the International Classification of Activities for Time Use Statistics (ICATUS). The survey initially classified activity into four major categories, namely SNA, non-SNA, learning, and other non-productive activities. As indicated in the objective, this research focuses on the unpaid activity related to the extended system national account. The time use survey obtained information of 15 sub categories of unpaid work divided into three major groups such as domestic activity, care activity and unpaid volunteering and community service related. For this analysis, the sample is restricted to individuals older than 18 years, resulting in a final unit of analysis. of 44,468 people.

Method of analysis

The analysis begins with the identification and classification of UCDW based on third party criterion. The criterion defines UCDW as productive activities, yet to be measured in conventional measure, must satisfy the delegation or. According to 'third party' criterion, an activity an activity is classified as UCDW if it is productive in nature and could be delegated to someone else for a market wage (United Nations, 2016: Charmes, 2019; Urdinola & Tovar, 2019). Based on this principle, we broadly classify UCDW into three broad categories such as domestic work, care activity, and unpaid community service. Domestic Work includes food management, cleaning and upkeep of dwellings and surroundings, do-it-yourself decoration, maintenance and small repairs, care of textiles and footwear, shopping, travel related to provision of unpaid domestic services, fire wood collection, and fetching water. Care Activity encompasses childcare, adult care and travel related to unpaid caregiving services to household members. Unpaid Community Service covers unpaid help to other households, community-organized services, organized unpaid volunteer services, involvement in civic and related responsibilities and travel related to community service and help to other households. In this stage, the time spent on each activity, disaggregated by gender and age, was computed directly from the Time Use Survey data.

To assess the socioeconomic impact of UCDW in Ethiopia, two distinct regression models were employed. The first model focuses on the factors that influence the time spent in leisure activities, including attending cultural events, participating in hobbies or games,

participating in indoor and outdoor sports, consuming mass media, and personal care and maintenance. The second model examines the determinants of hours worked on productive activities over the past week. In both models, the total time spent on UCDW (measured in minutes per day) serves as the key independent variable, reflecting how the allocation of time to unpaid care and domestic tasks influences individuals' ability to participate in other aspects of life. Additional independent variables in both models include residence (urban or rural), age, highest grade completed, sex (male / female), and the presence of children less than six years of age.

The core relationships are expressed through two equations:

$$Time\ spent\ on\ non-productive\ activitie = f\ (UCDW, demographic\ factors) \quad (1)$$

$$Time\ spent\ on\ productive\ activities = f(UCDW, demographic\ factors) \quad (2)$$

The first equation specified the time spent on nonproductive activities, which are crucial to individual well-being, social cohesion, and cultural development. The second equation represents the time spent on paid activity in the last 7 days as a function of the total hours spent on unpaid care and domestic work (UCDW) in 7 days and other factors. Specifically:

$$Nonproductive = \alpha + \beta 1 UCDWt + \beta 2 Gender + \beta 3 Age + \beta 4 education + \\ + \beta 5 childeren6 + \beta 6 residence + \epsilon \quad (3)$$

$$productive = \alpha + \beta 1 UCDWt + \beta 2 Gender + \beta 3 Age + \beta 4 education + \beta 5 childeren6 + \\ \beta 6 residence + \epsilon \quad (4)$$

The dependent variables are defined as follows: Nonproductive represents the total hours spent on leisure activities over the past 7 days. Conversely, Productive represents the total time spent on paid activities during the same period. The key independent variable, UCDWt, measures the total hours spent on unpaid care and domestic work in the last 7 days. Control variables include gender represents the sex of the respondent (1= male, 0 = female), education (the highest grade completed), age represents the age of the respondent in years, childern6 represents the presence of child under 6 years old (1= Yes, 0=No) and finally residence represents place of residence (1=urban, 0=rural).

While the Ordinary Least Squares (OLS) and Tobit models were initially considered. a primary methodological concern is the potential endogeneity of UCDWt. This variable may not be fully exogenous, as it might be affected by innate ability and the availability of infrastructure. In multiple linear regression and Tobit model, if at least one regressor potentially correlated with the error term, the assumption of exogeneity is violated, which is called the regression suffer from endogeneity(Wooldridge, 2017). The source of endogeneity could be omitting an important variable, measurement error, or the dependent variable, and at least one of the independent variables are determined

simultaneously in a system. Thus, in the presence of endogeneity, the OLS and Tobit estimate is biased and inconsistent. To account for endogeneity the study employs a Two-Stage Least Squares (2SLS) approach. The model is specified as follows.

$$Yi = B0 + \beta iP + \beta i(X1 + X2 + \cdots .Xk) + \varepsilon i \quad (5)$$

Pi represents the endogenous variable, that is, the time spent unpaid care and domestic work, $X_1 + X_2 + .X_k$ represents the vector of the exogenous variable. Using OLS to equation 5 will result in biased and inconsistent result. in this context (Wooldridge, 2017) recommend 2SLS procedure to deal with endogeneity. The 2SLS model is specified as follows:

Stage 1: First-stage regression (predicting the endogenous variable UCW)

$$UCWi = \beta 0 + \beta_1 Age + \beta_2 Sex + \beta_3 Education + \beta_4 ChildUnder6 + \beta_5 Place\ Residence + \mu i \quad (6)$$

- Here, UCW is regressed on all exogenous variables, and the instrument is Place of residence (1= urban, -=rural).

- μi is the error term in the first stage.

- This stage produces predicted values (UCW)i.

Stage 2: Second-stage regression (main equation)

$$Yi = \beta 0 + \beta 1\ Age + \beta 2\ Sex + \beta 3 Education + \beta 4\ ChildUnder6 + \beta 5\ (UCW)i + \epsilon i \quad (7)$$

- Here, the dependent variable is regressed on exogenous variables and the predicted values of UCW from the first stage.
- ϵi is the error term in the second stage.
- β5 captures the causal effect of UCW on Yi, purged of endogeneity bias.

Result and Finding

Table 1: Descriptive statistics

	Mean (n= 44,468)	Std. Deviation	Skewness	Kurtosis
Hours spent on non-productive activities in the last 7 days	15.9	4.28	.675	.531
Hours spent on productive activities in the last 7 days	40.08	20.127	.685	.327
Age	37.56	13.047	.987	0.458

Highest Grade Completed	8.26	9.641	2.044	2,708
Number of household members	4.25	2.208	.456	-.265
Total time spent on UCDW (minutes per day)	115.93	161.445	1.179	1.147
		Frequency	**Percentage**	
Sex	Male	21,340	47.99	
	Female	23,128	52.01	
Residence	Urban	13,284	29.87	
	Rural	31,184	70.13	

Table 1 summarizes the time allocation and demographic characteristics of the sample. On average, individuals spend 15.9 hours a week on leisure activities and 40.1 hours on paid, income-generating activities. The data further reveal that individuals on average spent two hours a day on unpaid care and domestic work. Demographically, the average respondent is 37 years old and has completed grade 8. The survey data showed that in Ethiopia the household size on average is 4 members (4.5 in rural area and 3.9 in urban area).

Factors Influencing Time Spent on Non-Productive Activities

The regression model (Table 2) provides an in-depth understanding of the factors influencing the time spent on non-productive activities in Ethiopia, including attending cultural events, participating in hobbies and games, participating in sports, consuming media and personal care activities. These activities are crucial to individual well-being, social cohesion, and cultural development. By examining demographic and socioeconomic variables, the model offers insight into how different groups allocate their time and how these patterns can inform broader social development policies. The findings highlight the interplay of residence, age, education, gender, and unpaid care work in shaping non-productive time use. The study has conducted the endogeneity test and the instrumental validity test to check the suitability of the model. The result showed that the UCDW is an endogenous variable and the place of residence is a strong instrument variable (see Appendix 1).

Table 2: Regression analysis of factors influencing time spent on nonproductive activities (cultural events, hobbies, sports, mass media, and personal care)

Instrumental variables (2SLS) regression			*Number of obs* = *23,510*		
			Wald chi2(5) = *965.56*		
			Prob > chi2 = *0.0000*		
			Root MSE = *3239.9*		
nonPH	Coef.	Standard. Err.	Z	[95% Conf.Interval]	
UCDW	-1.237***	.218	-5.93	-1.64	-.829
Age	35.12 ***	1.71	20.46	31.75	38.48
Presence of child under 6 years (1= Yes, 0=No)	318.21***	108.77	2.93	105.03	531.40
Sex(1=Male, 0=female)	843.22***	265.35	3.18	323.13	1363.31
Highest grade completed	-.041	.86	-0.05	-1.73177	1.64
Constant	10517.43	231.67	45.40	10063.37	10971.5
Instrumented: Time spent on UCDW Instruments: Place of residence (1=Urban, 0=Rural)					

The analysis shows that for every additional minute spent on Unpaid Care and Domestic Work (UCDW) each day slightly reduces the time they spend on leisure or non-productive activities. The relationship is shown by the negative value of -1.237, meaning that unpaid care responsibilities limit people's opportunities for leisure. The study found that older individuals tend to spend more time on non-productive activities, with a positive value of 35.12. The analysis also shows that men tend to spend more time on non-productive activities compared to women, with a value of 843.22. Households with children under six years of age spend slightly more time on non-productive activities, with a positive value of 318.21. This may reflect the time parents spend engaging in leisure or social activities with their young children.

Determinants of Hours Worked in Productive Activities

The regression analysis (Table 3) explores the factors that influence the total hours worked on productive activities over the past week, focusing on variables such as education, sex, time spent on Unpaid Care and Domestic Work (UCDW), and the presence of children under six years of age. The dependent variable in this model represents productive labor time, which is essential for understanding the dynamics of economic development. The results provide valuable information on the relationship between these factors and the broader implications for labour markets, productivity, and societal economic growth. The study has conducted the endogeneity test and the instrumental validity test to check the appropriateness of the model. The result showed that the UCDW

is an endogenous variable and the place of residence is a strong instrument variable. (See Appendix 2)

Table 3: Determinants of Hours Worked for Productive Activities: A Regression Analysis

Instrumental variables (2SLS) regression				Number of obs = 17,991 Wald chi2(5) = 624.19 Prob > chi2 = 0.0000 Root MSE = 476.84	
productiveH	Coef.	Std. Err.	z	[95% Conf.	Interval]
UCDW	-.439***	.021	-20.5	.480	-.397
Age	.678**	.310	2.18	.069	1.287
Presence of child under 6 years (1= Yes, 0=No)	149.73***	11.31	13.24	127.56 171.89	
Sex(1=Male, 0=female)	450.11***	26.78	16.80	397.61 502.61	
Highest grade completed	.141	.14	1.01	-.133	.416
Constant	144.50	24.10	6.00	97.26	191.74
Instrumented: Time spent on UCDW Instruments: Place of residence(1=Urban, 0=rural)					

The time spent on unpaid care and domestic work has a noticeable effect on productive work hours. Each additional minute spent on UCDW per day reduces time in productive work is by 0.44 minutes. This shows that unpaid work responsibilities, such as childcare, cooking, or cleaning, take time away from paid work. This issue is particularly significant for women, who tend to take on most UCDW, limiting their ability to contribute to the formal economy.

As people age, the number of hours they work tends to decrease slightly, by about 0.67 hours per additional year of age. This trend reflects the natural progression of life, as older individuals may work less due to retirement, health issues, or shifts to less demanding roles. Education has a small but positive effect on working hours. For every additional year of schooling, people work slightly more hours in productive activities. This reflects the fact that education often leads to better job opportunities, which can require more time commitment.

Persistent gender inequalities in household and caregiving responsibilities significantly limit women's ability to participate fully in paid work. Households with young children

under six years of age tend to dedicate slightly more hours to productive activities. This may be due to the financial pressure of supporting children, which drives parents to seek additional income. However, having young children also increases caregiving responsibilities, creating competing demands on parents' time.

Discussion

The findings highlight the significant constraints that Unpaid Care and Domestic Work (UCDW) impose on women's economic participation and productive / non-productive work in Ethiopia, consistent with global evidence on gendered division of labour. The results of the research contribute to expanding the literature using Ethiopian statistical service time use data, providing detailed information on time allocated to paid and unpaid work across gender, age, and other demographic and socioeconomic sides. The issue of unpaid work is especially relevant for women, who often carry a larger share of these responsibilities. The finding shows that increased time spent on UCDW is associated with reduced opportunities for non-productive activities. A consistent trend across different contexts, showing that increased involvement in UCDW is correlated with reduced time allocated to leisure and other non-productive activities and well documented in studies by ILO (2024; Addati et al., 2018; ILO, 2018) and Oxfam (2020), which emphasize how UCDW disproportionately burdens women, curtailing their opportunities for education, career development, and income generation.

As people age, they may reduce their work or caregiving responsibilities, freeing up time for non-productive activities like hobbies, self-care, or relaxation. Older adults may have more free time available to engage in non-productive activities, such as hobbies, leisure pursuits, or socializing. With age, individuals can prioritize leisure and enjoyment over productivity. This aligns with research indicating that retirement can lead to increased leisure time (Liu et al., 2024). This shift highlights the importance of providing older adults with opportunities to participate in meaningful recreational activities. Communities could offer tailored programs, such as senior-friendly exercise facilities or cultural events, to ensure older adults remain active, socially connected and fulfilled. Policies that ease caregiver burdens, such as public childcare services or flexible work options, could help people balance these responsibilities and spend more time in productive work.

The study found a strong negative correlation between women and time spent on non-productive activities. The traditional norms on gender roles, where women often shoulder disproportionate burden on unpaid care and domestic work often associated with more caregiving and domestic tasks, reducing their leisure time. Although the difference is not very large, it underscores the persistent gender imbalance in time use. The strong negative correlation between women and time spent on non-productive activities is influenced by traditional gender roles, time poverty, work-life balance challenges, cultural expectations, and economic factors that compel women to prioritize productive tasks over leisure or non-productive engagements. These dynamics illustrate the complex interplay between

gender and time use in contemporary society. This reinforces studies indicating women spend less time in leisure compared to men (Dula, 2019; Hall & Vincent Aranas, 2013; Mezmur et al., 2017; Rania Antonopoulos & Hirway, 2010). Policies and social programs should focus on reducing the unequal distribution of domestic work, for instance, by encouraging men to take on more household responsibilities and by providing better childcare options.

The analysis revealed a strong positive correlation between the presence of a child under 6 years of age and time spent on non-productive activities (specifically 28.55 more units). While this result might seem counterintuitive, it is well-supported by existing literature(Maestre et al., 2016; Oloo & Parkes, 2021). This phenomenon canbe attributed to increased caregiving responsibilities, time constraints, fatigue from parenting demands, shifting priorities toward child-centered activities, and economic pressures that prioritize work over leisure. These factors collectively illustrate how parenting young children can significantly impact the allocation of time toward non-productive engagements. Although this can be seen as quality family time, it also indicates the additional demands placed on families with young children. Providing accessible childcare, parenting programs, and family-friendly recreational spaces can support these families and improve their overall well-being.

Conclusions

These findings show the role of Unpaid Care and Domestic Work (UCDW) in shaping individual time allocation. UCDW significantly restricts leisure opportunities, particularly for women and individuals in larger households, thereby reinforcing gender and social inequalities. Factors such as regional disparities, educational attainment, and gender differences further influence the availability of time for personal and recreational activities. Furthermore, UCDW notably reduces time available for paid work, with women disproportionately affected. This underscores a critical challenge to achieving SDG 5 (Gender Equality), specifically Target 5.4 on recognizing and valuing unpaid care.

To address these findings, targeted policies are needed to reduce the burden on UCDW and ensure equitable access to leisure and personal development opportunities. This requires strategic investment in care infrastructure (e.g., affordable childcare), alongside rural development initiatives focused on job creation, infrastructure, and access to markets to support dependent on informal or seasonal work. Furthermore, promoting gender equality in domestic responsibilities and creating tailored programs for older adults can improve overall well-being. Such efforts not only improve the quality of life of individuals, but also foster more inclusive, balanced, and cohesive societies. Ultimately, the regression results underscore, by recognizing and addressing the impact of UCDW on time use and social development through such strategies, policymakers can create a more supportive and sustainable social framework that fosters inclusive, balanced, and cohesive societies for all.

Resolving gender disparities requires the promotion of shared household responsibilities and implements supportive public policies. Specifically, the creation of policies such as paid parental leave, affordable childcare services, and flexible working arrangements, to help women participate more in the workforce. Addressing these inequalities requires promoting shared household responsibilities and implementing supportive policies, such as paid parental leave, affordable childcare, and flexible working arrangements is essential to empower women to participate more fully in the workforce and manage their responsibilities more effectively.

Since the study results show how unpaid care and domestic work restrict participation in productive work, addressing these challenges through targeted policies —including investments in care infrastructure, rural development, and education—can unlock greater economic participation and productivity. By creating supportive environments that balance work and caregiving responsibilities, societies can foster inclusive economic growth, benefiting individuals, families, and communities as a whole.

Ethical Considerations

The Network of Ethiopian Women Associations (NEWA), in collaboration with the International Development Research Centre (IDRC), is the owner of this research, which was carried out according to NEWA's ethical guidelines. The ethical clearance number is NEWA/469/24.

Informed Consent

We are committed to upholding the highest standards of research ethics and participant confidentiality. In line with this commitment: Anonymity and Confidentiality were ensured, and all work adheres to the terms and conditions outlined in the official data sharing agreement between the Ethiopian Statistical Service (ESS) and NEWA.

Conflict of Interest

The authors declare that they have no competing interests or other interests that might be perceived to influence the results and/or the discussion reported in this paper.

Data Availability Statements

The analysis leveraged secondary data collected from the Ethiopian statistical Service. The corresponding author will make the well-organized data available upon request.

Clinical trial number

No/Not applicable

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Appendix 1

1.1. Test for endogeneity

Ho: variables are exogenous	
Durbin (score) chi2(1) = 12.6362 (p = 0.0004)	Reject H0: UCDW is not exogenous and— needs instrumenting.
Wu-Hausman F(1,23503) = 12.6392 (p = 0.0004)	Reject H0: UCDW is not exogenous and— needs instrumenting.

Since $p < 0.05$, we reject the null of exogeneity - 2SLS is appropriate and necessary.

1.2. Test for instrumental validity

First-stage regression summary statistics

		Adjusted	Partial		
Variable	R-sq.	R-sq.	R-sq.	F(1,23504)	Prob > F
UCDW~l	0.2925	0.2923	0.0094	224.083	0.0000
Minimum eigenvalue statistic = 224.083					
Critical Values			# of endogenous regressors: 1		
Ho: Instruments are weak			# of excluded instruments: 1		
		| 5%	10%	20%	30%
2SLS relative bias		| (not available)			
		| 10%	15%	20%	25%
2SLS Size of nominal 5% Wald test		| 16.38	8.96	6.66	5.53
LIML Size of nominal 5% Wald test		| 16.38	8.96	6.66	5.53

Since 224.08 > 8.96, your instrument is not weak, even under very strict criteria (5% bias). 2SLS results can be trusted for causal interpretation, assuming that the instruments are also exogenous.

Appendix 2

2.1. Endogeneity tests

Ho: variables are exogenous	
Durbin (score) chi2(1) = 1435.87 (p = 0.0000)	Reject Ho: UCDW is not exogenous and needs instrumenting.
Wu-Hausman F(1,17984) = 1559.79 (p = 0.0000)	Reject Ho: UCDW is not exogenous and needs instrumenting.

2.2 Test for instrumental validity

First-stage regression summary statistics

		Adjusted	Partial		
Variable	R-sq.	R-sq.	R-sq.	F(1,17985)	Prob > F
UCDW~l	0.2934	0.2932	0.0276	509.549	0.0000
Minimum eigenvalue statistic = 509.549					
Critical Values				# of endogenous regressors:	1
Ho: Instruments are weak				# of excluded instruments:	1
		5%	10%	20%	30%
2SLS relative bias			(not available)		
		10%	15%	20%	25%
2SLS Size of nominal 5% Wald test		16.38	8.96	6.66	5.53
LIML Size of nominal 5% Wald test		16.38	8.96	6.66	5.53

Since 509.55 > 8.96, your instrument is not weak, even under very strict criteria (<5% bias). 2SLS results can be trusted for causal interpretation, assuming that the instruments are also exogenous.