



# Who has more say on your daily time use?

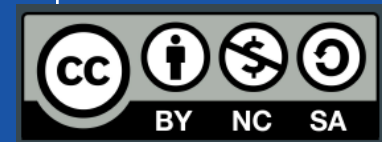
A quantitative intra-household time-use altruism analysis

Yusak O. Susilo

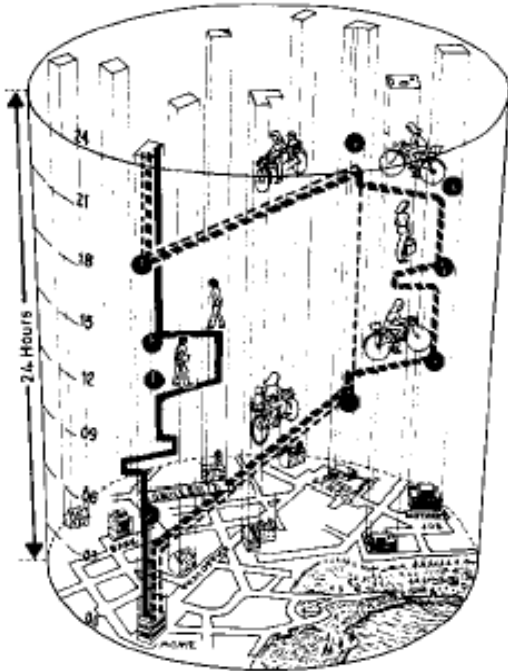
KTH Royal Institute of Technology

Acknowledgement:

Chengxi Liu, VTI, the Swedish National Road and Transport Research



# Time



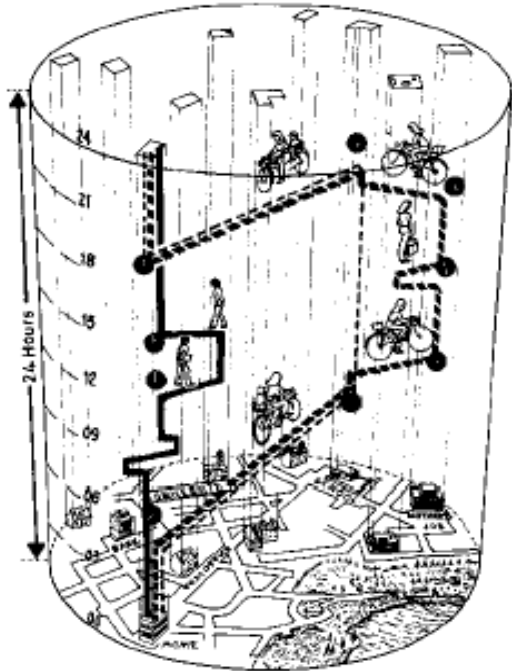
One of the most important variables/resources in our decision making tools – VTTS, hägerstrand time-space constraints, positive utility of travel time, etc.

Different people have different ways to prioritise things within their available time. Some are more repetitive than others, whilst some are more random.

Not only individual decisions, but also **intra-household negotiation** - In the case of limited resources, negotiation happens, and different culture have different mechanism, expectation and habits



# Time



Most of previous studies focused on:

- Individual's time allocation – mostly one day, some time multi-day
- How time, as an individual/hh-level resources, has been distributed across different household members (for different activity).
- How time, as a constraints, has triggered multi-tasking/multi-modal/trip chaining participations.

On multiday context, this study focuses **on who, within your household, actually influences your time allocations, how much, and how.**





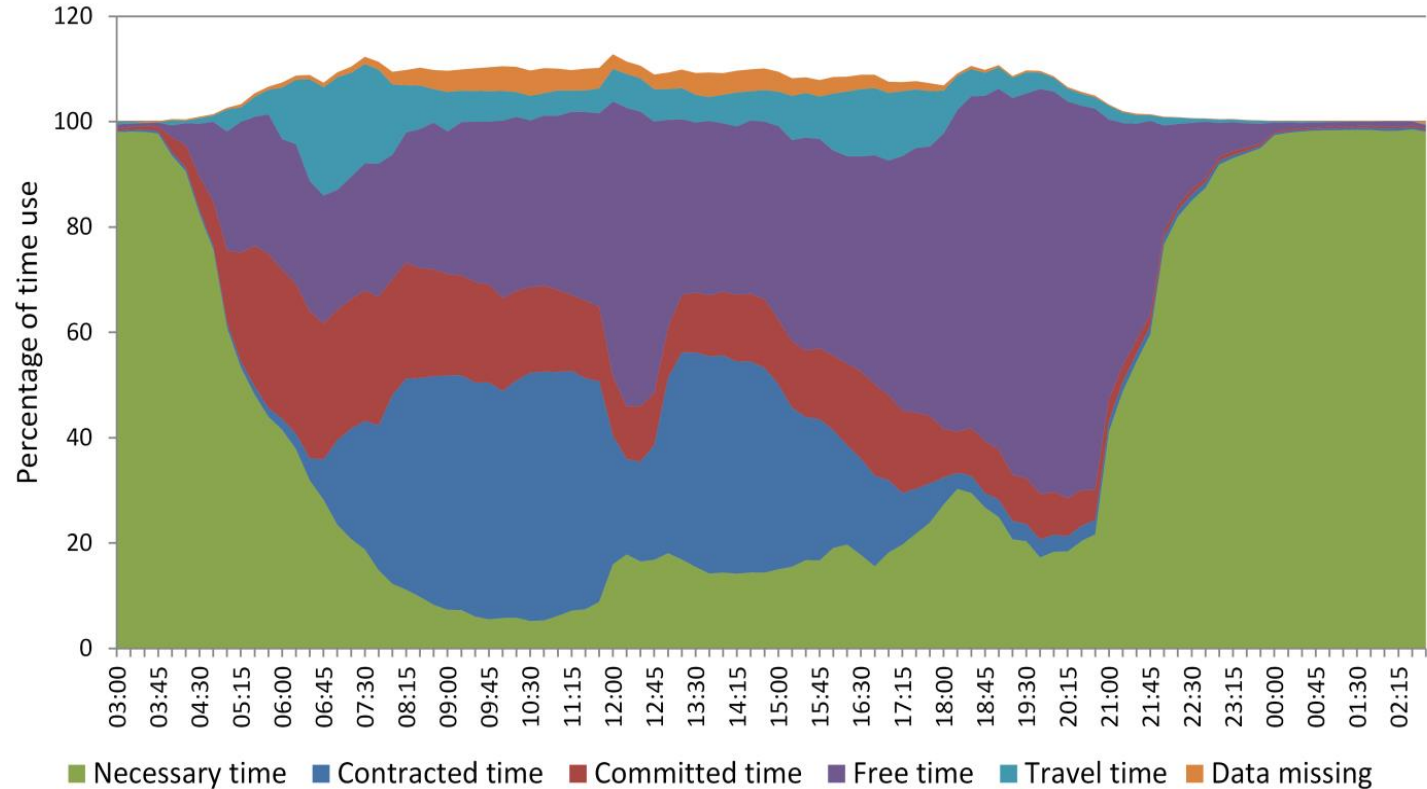
## Case study

Developing countries: A three-week time use and activity travel diary is used for this purpose, was collected in the city of Bandung city, Indonesia. 732 individuals and 191 households for 21 consecutive days.

Contains household, physical activity and lifestyle, individual's subjective characteristics, time-use diary, and subjective well-being data.

Time use diary: twenty-three in-home and out-of-home activity classifications, travel duration and mode characteristics, and multitasking activities for adults, young adults and children above 7 years old. Recorded in 15 minutes interval 24 hours a day





We focused on the six **typical shared activities**, i.e. grocery shopping, household chores, babysitting, picking up children, relaxing, and social activities.

- Comparing:
1. 2 adult hh, as a separate individual,
  2. 2 adult hh, as one hh unit
  3. The whole hh (adults + eldest child), as a hh unit, with panel effects



# How do we measure who influence more of one's time use allocation?

For a 2-adults' household case:

Who ended up be the main person doing a particular activity, e.g. grocery shopping, on the given day

(i.e., who spent more time on grocery shopping on day  $t$ )

Husband spent more time on shopping:

$$U_h = w_h(X_h\beta^1) + (1 - w_h)(X_w\gamma^1)$$

Wife spent more time on shopping:

$$U_w = w_w(X_w\beta^2) + (1 - w_w)(X_h\gamma^2)$$

They spend equal time:  $U_e = 0$  (*baseline utility, set as 0*)

Probability of household's having husband/wife as the grocery shopper is:  $P = \frac{e^{U_f/U_m}}{e^{U_f+e}U_m+eU_e}$  (Multinomial Logit model with non-linear utility)



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Influences/utility part that is attributed/related to husband and wife

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$$U_w = w_w (X_w \beta^2) + (1 - w_w) (X_h \gamma^2)$$

$w_h$  (0-1): an indicator of who contribute more to the given decision  
 $w_h=1$ : all is attributed to husband's characteristics, wife's attributes have no significant influence on husband's time use on grocery shopping, for example  
 $w_h=0$ : husband's time spent on grocery shopping is completely dependent on wife's attributes on grocery shopping, and not his





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They spend equal time.  $U_e = 0$  (*baseline utility, set as 0*)

$w_w$  (0-1): an indicator of who contribute more to the given decision

$w_w=1$ : the decision is fully contributed to wife's attributes/utility, husband's characteristics/utility part has no influence on wife's time use on this particular activity

$w_w=0$ : the wife's time spent on this particular activity is completely dependent on husband's characteristics/utility.



# How do we measure who influence more of one's time use allocation?

For a 2-adults' household case:

$w_h/w_w$  is further parametrised:  $\frac{e^{\text{household and day of the week}}}{1+e^{\text{household and day of the week}}}$ , so weights are dependent on day of the week, residential built environment/number of children, household income, etc. activity, y t)

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# How do we measure who influence more of one's time use allocation?

For households with children:

(for families with more than one child, we take the mean of time use of all children between 7-18 years old)

$$y_{i,t} = \begin{cases} 0, & \text{if } -\infty < y_{i,t}^* < \mu_0 \\ 1, & \text{if } \mu_0 < y_{i,t}^* < \mu_1 \\ \dots & \\ m, & \text{if } \mu_{m-1} < y_{i,t}^* < +\infty \end{cases}$$

Modelling the time use order in a given household (who spend the most/least time), each observation is a father/mother/kid's ordered about time use.

For instance, for a given family, if the time use of father is 40 min, mother is 30 min, kid is 10 min for a given type of activity (shopping for instance), then we have 3 observations with the following dependent variable values: father=1 (spent the most time), mother=2 (spent the second most time), kid=3 (spent the least amount of time).

In case if any of the two household members have the same time use, for instance, father=40 min mother=kid=30 min for housework activities, then we assume a certain household member is the main responsible member and rank him/her 1<sup>st</sup>.

$$y_{i,t}^* = w_f(X_{f,t}\beta_f + \delta_f y_{f,t-1}\gamma_f + Z_f\alpha_f) + w_m(X_{m,t}\beta_m + \delta_m y_{m,t-1}\gamma_m + Z_m\alpha_m) + w_c(X_{c,t}\beta_c + \delta_c y_{c,t-1}\gamma_c + Z_c\alpha_c) + \alpha_0 y_{i,0} + \theta_i + \varepsilon_{i,t}$$



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$y_{f,t-1}; y_{m,t-1}; y_{c,t-1}$  are the previous day's rank of time use in a given household for father, mother and children, capturing the inertia effect.

we assume a certain household member is the main responsible member and rank him/her 1<sup>st</sup>.

$$y_{i,t}^* = w_f(X_{f,t}\beta_f + \delta_f y_{f,t-1} \gamma_f + Z_f \alpha_f) + w_m(X_{m,t}\beta_m + \delta_m y_{m,t-1} \gamma_m + Z_m \alpha_m) + w_c(X_{c,t}\beta_c + \delta_c y_{c,t-1} \gamma_c + Z_c \alpha_c) + \alpha_0 y_{i,0} + \theta_i + \varepsilon_{i,t}$$



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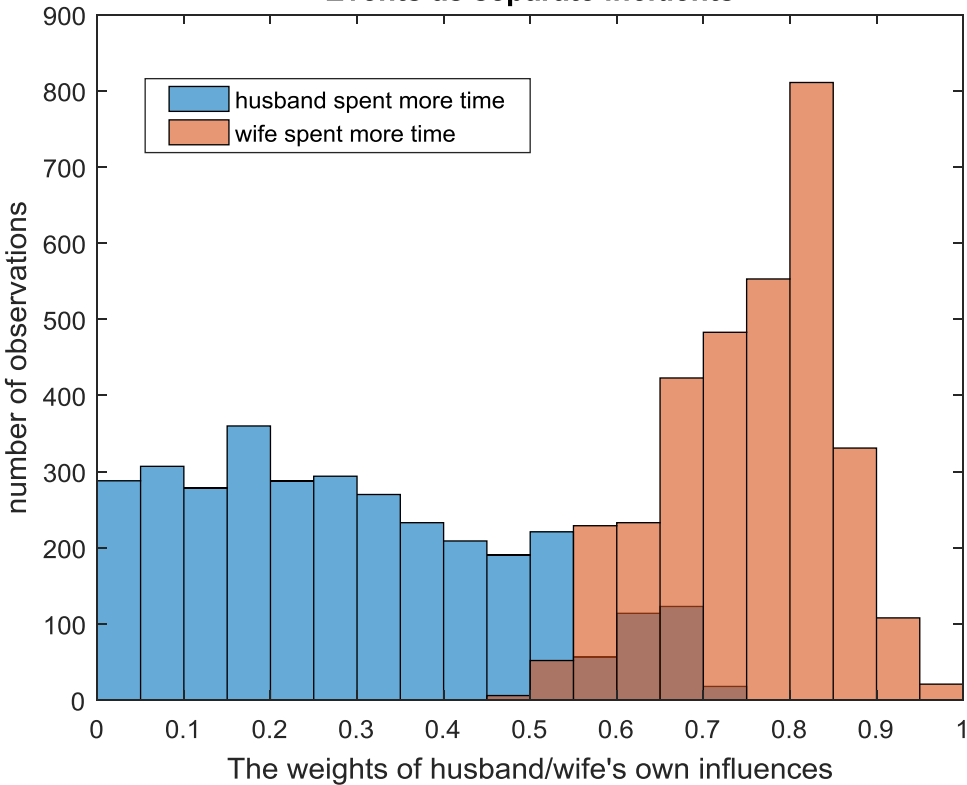
In case if any of the two household members have the same time use, for instance father 40 min mother kid 30 min for housework activities, then we

*Panel effect considered: 21 consecutive observations (days) from the same individual.*

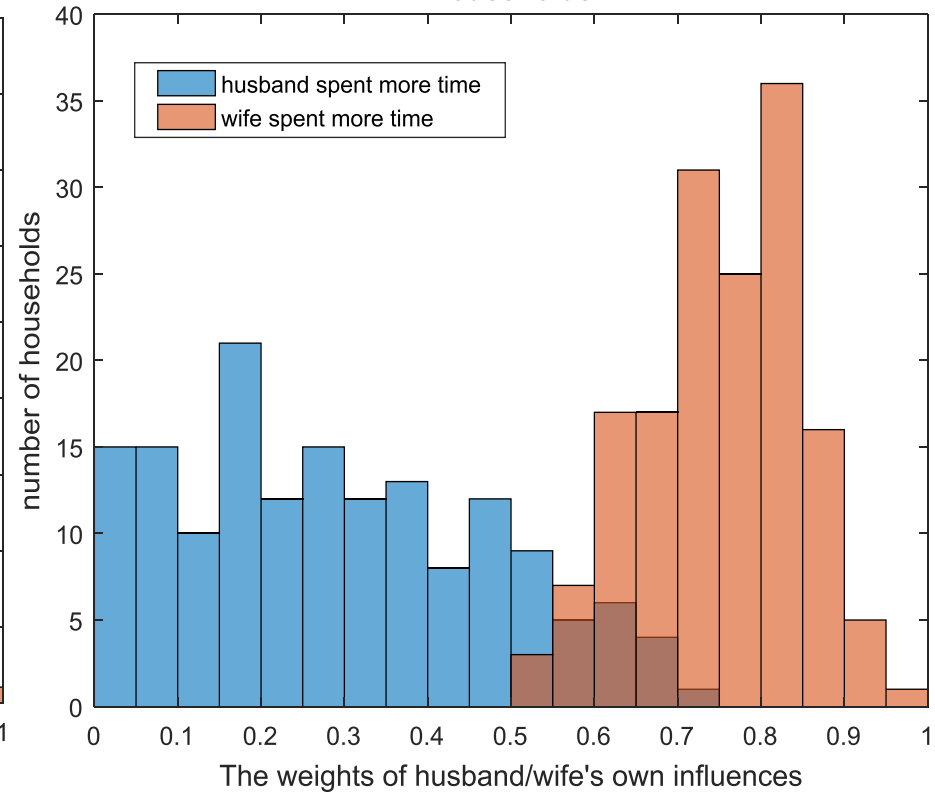
$$y_{i,t}^* = w_f(X_{f,t}\beta_f + \delta_f y_{f,t-1}\gamma_f + Z_f\alpha_f) + w_m(X_{m,t}\beta_m + \delta_m y_{m,t-1}\gamma_m + Z_m\alpha_m) + w_c(X_{c,t}\beta_c + \delta_c y_{c,t-1}\gamma_c + Z_c\alpha_c) + \alpha_0 y_{i,0} + \theta_i + \varepsilon_{i,t}$$

# Estimation results (housework)

Events as separate incidents



Households





## Estimation results (housework)

Who is more likely to spent more time on housework/in-home household chores than their spouse?

**Husband** who is/either (1) between 36 and 55 years old, with a wife who is/either (1) unemployed, (2) aged between 26 and 35 years old

**Wife** who is (1) unemployed, (2) 36-45 years old, with a husband who is aged between 36-55 years old

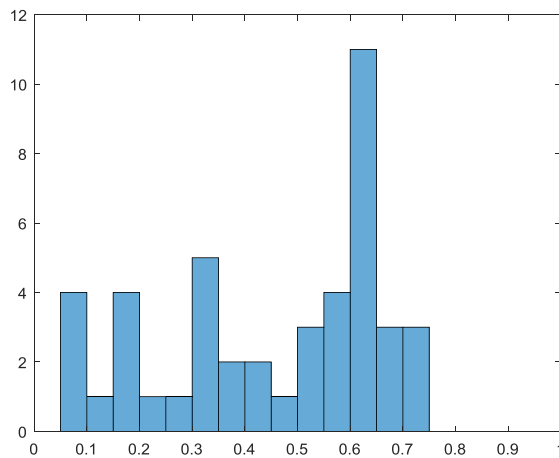
What influence husband and wife's altruism?

When the **husband** is/either (1) belong to households with medium income, (2) have more children, (3) reside at a highly dense areas and/or (4) far away from CBD

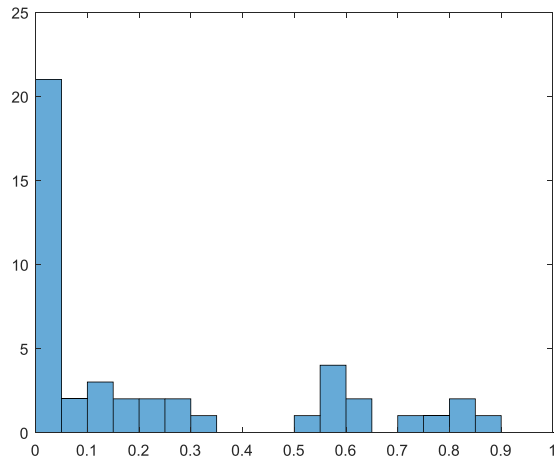
When the **wife** is/either (1) on weekend, (2) belong to household with medium income, (3) resides at a lower dense areas



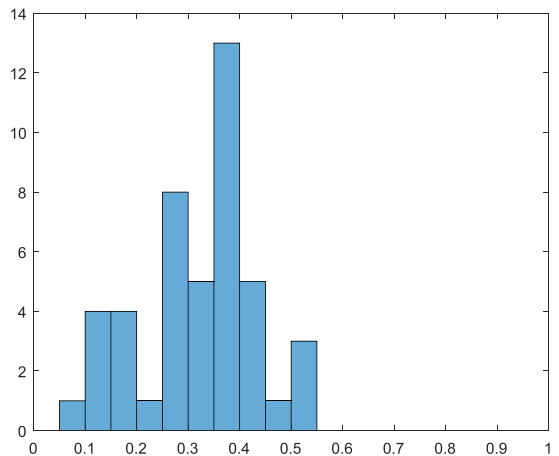
Father:  
( $w_f$ )



Mother:  
( $w_m$ )



Oldest  
Child:  
( $w_c$ )



The **mother** and the **eldest child** are the ones who mostly exhibit a strong day-to-day dynamic and inertia (continuity) of doing the housework. However, this is not the case for father (insignificant), despite on average the **father is the one who mostly responsible ( $w_f$ ) in driving other hh members to spend time on this activity.**

**Mother's** influence on housework time use of other household members':

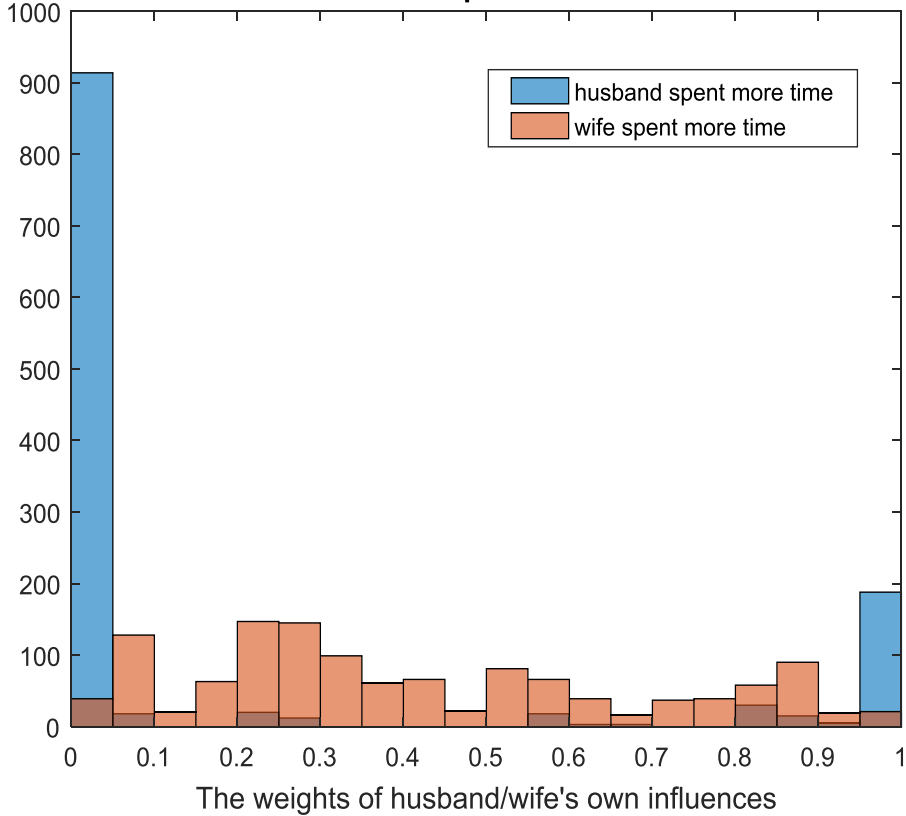
(-) Having motorized vehicles in households,

(+) live close to grocery store and shopping center.

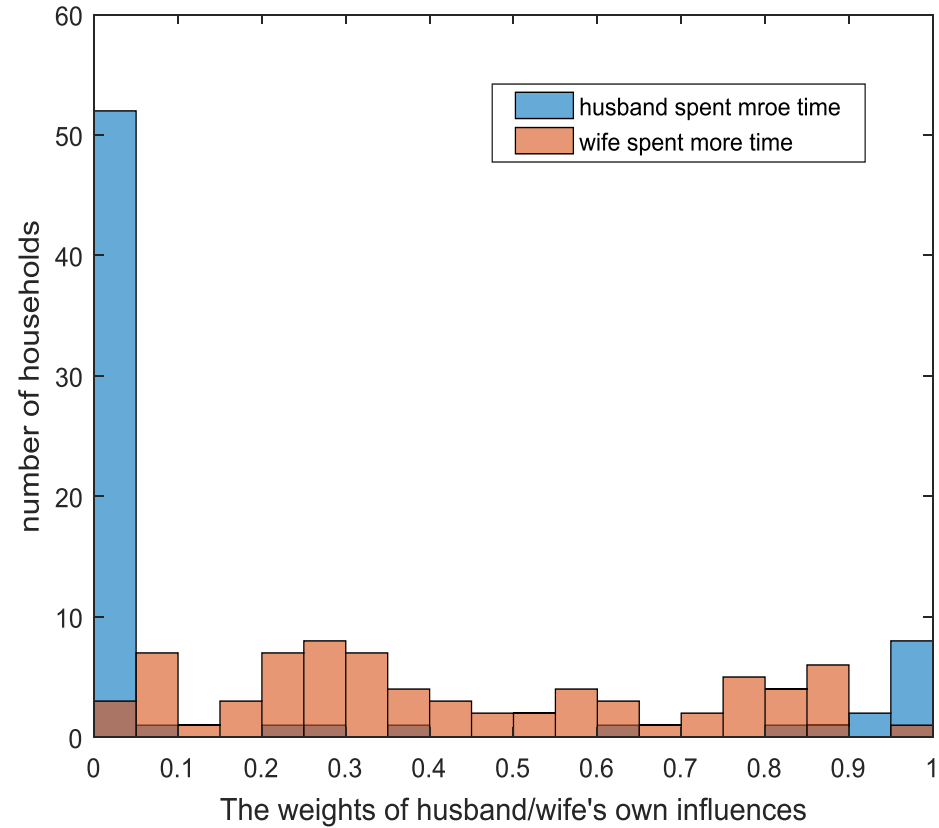


# Estimation results (babysitting)

Events as separate incidents



Households





## Estimation results (babysitting)

Who is more likely to spent more time on baby-sitting than their spouse?

**Husband** who is/either (1) unemployed, (2) 46 years old or older, with a wife who is/either (1) has part-time job, (2) less than 55 years old

**Wife** who is/either (1) unemployed, (2) less than 55 years old, with a husband who has permanent or part-time job

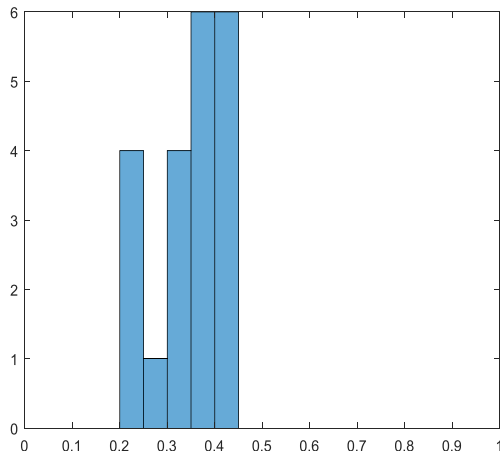
What influence husband and wife's altruism?

When the **husband** is/either (1) belong to households with many young children (less than 13 years old), (2) resides in areas far away from the CBD

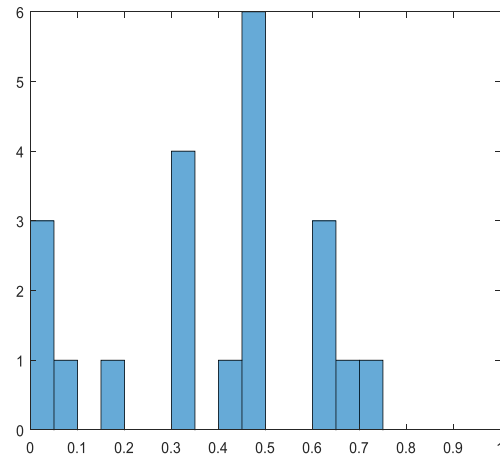
When the **wife** is/either (1) on weekend, (2) belong to household with high income, (3) has few children (both young and teenagers), (4) resides at easy access areas from CBD



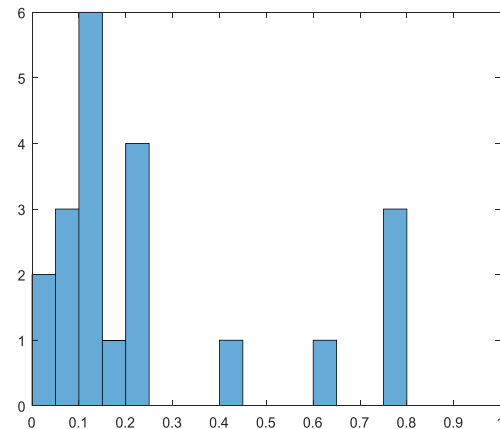
Father:  
( $w_f$ )



Mother:  
( $w_m$ )



Oldest  
Child:  
( $w_c$ )



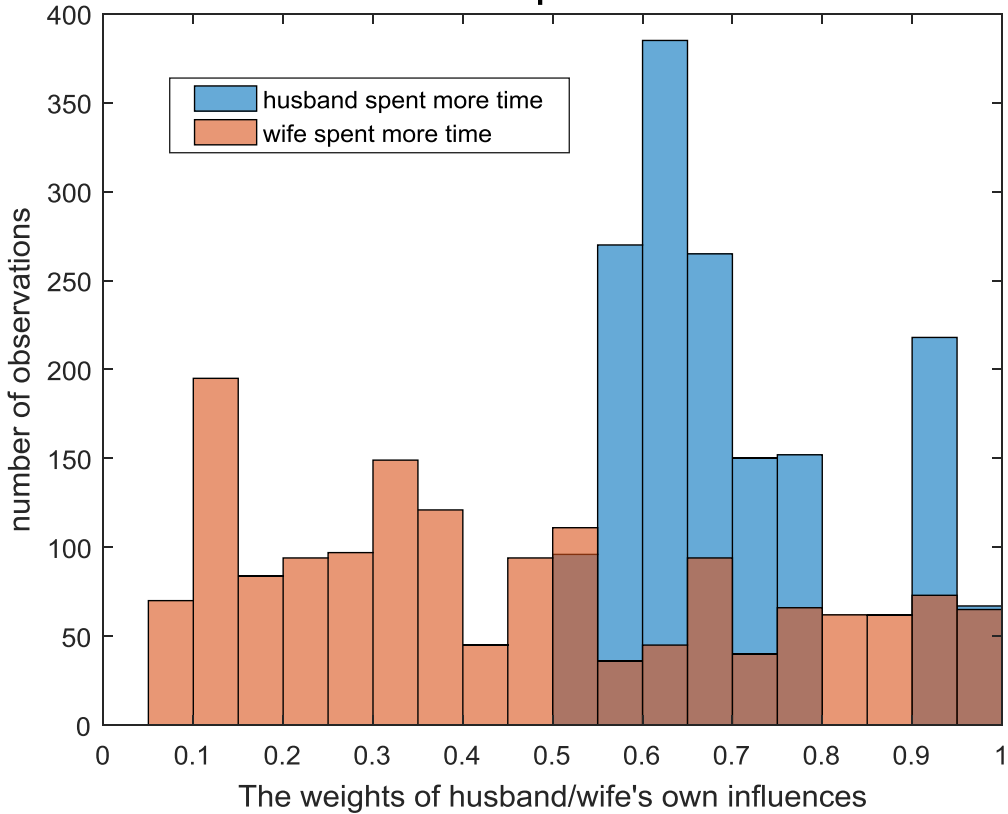
**Exhibit of need a break:** previous day's babysitting time use has a negative effect for father's and mother's time spent on baby sitting on the previous day.

Father between age 26-35 also will do more

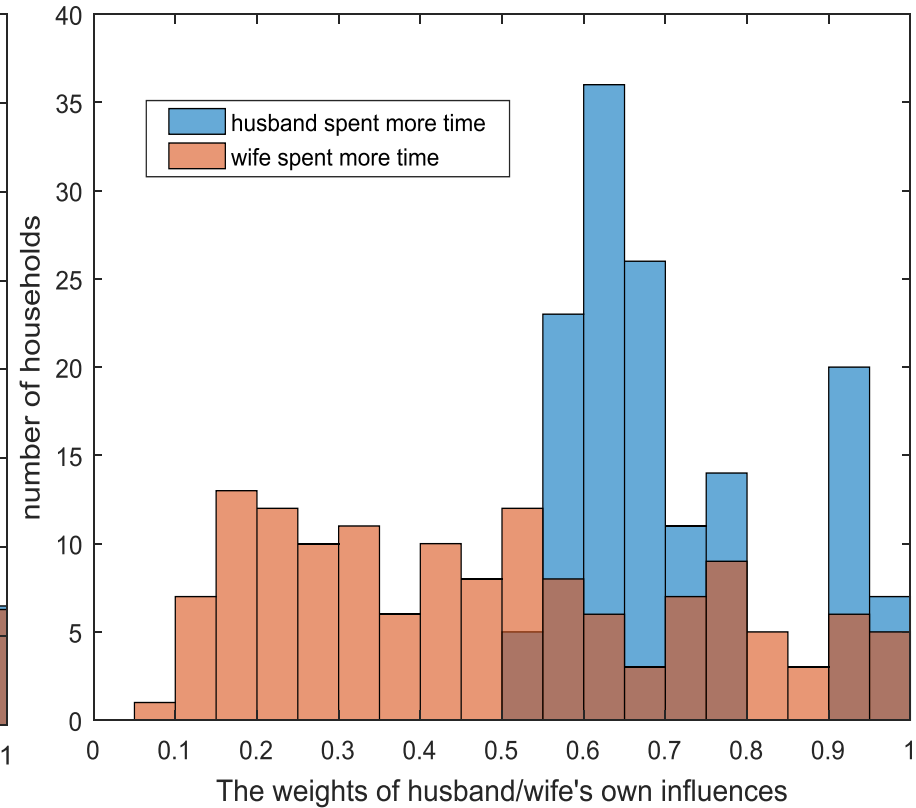
Living close to shopping center corresponds to a lower weight for father and mother but a higher weight for older children.

# Estimation results (Grocery shopping)

Events as separate incident



Households





## Estimation results (Grocery shopping)

Who is more likely to spent more time on grocery shopping than their spouse?

**Husband** who is/either (1) has a permanent job, (2) belong to younger generation (14-25 years old), with a wife who is/either (1) unemployed, (2) belong to an older generation (older than 46 years old)

**Wife** who is/either (1) belong to older generation, (2) employed (either permanent/part time), and has a husband who is/either (1) has a permanent job and (2) belong to younger generation

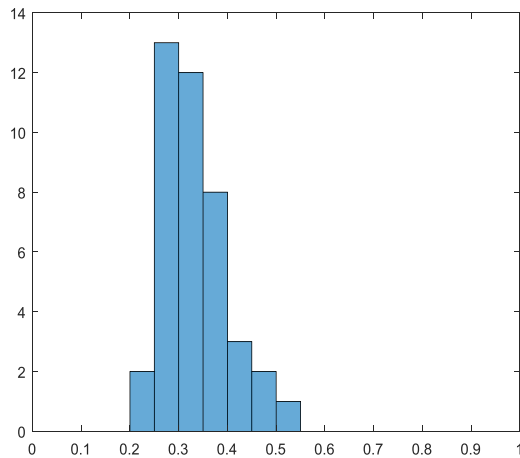
What influence husband and wife's altruism?

When the **husband** is/either (1) belong to households with low income, (2) resides at highly dense areas

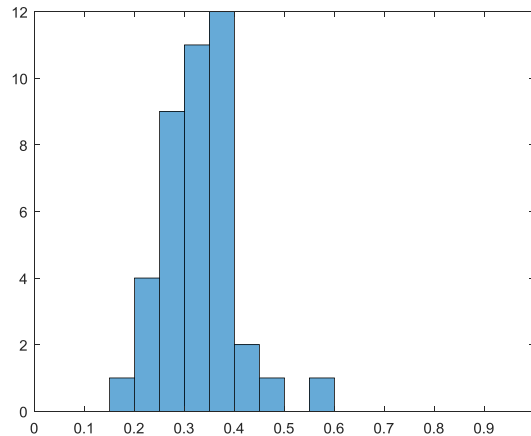
When the **wife** is/either (1) on weekday, (2) belong to household with fewer motorised vehicles, (3) has no/fewer 14-17 years old children



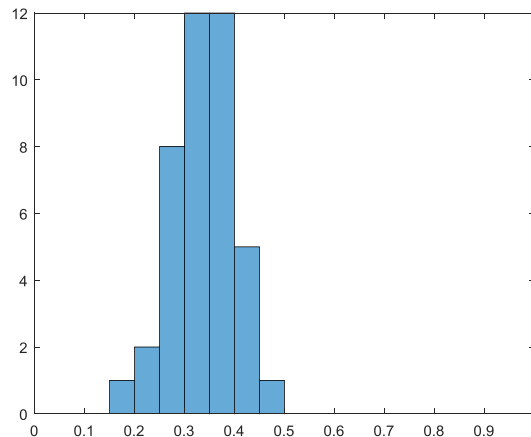
Father:  
( $w_f$ )



Mother:  
( $w_m$ )



Eldest  
Child:  
( $w_c$ )



Mother has the most stable (repetitive) grocery shopping than the father and the eldest child.

Mother's influence to the activity time spent (of other hh members') is lower in low income households and households without motorized vehicles.

Father's influence in particular higher on denser populated areas.



## So what have we learned from this study?

- Weights of altruism differ substantially among hh members and between different activity types
- The hh members and panel effects inclusion re-distributes the influences across hh-members more fairly – patterns are unique for each activity type.
- Typical Asian hhs?: wives have a lot of power in influencing time use allocations among household members.
- Income and presence of children polarise husband's altruism behaviours (weights)
- **The role of opportunities:** Accessibilities to wider crowd and amenities matter

How does the result has been different than some studies in developed countries?

- A very strong tendency of (full/strong) delegation of activities/responsibilities (highly depends on context, especially in relation to husbands' condition) – nobody always in charge, but definitely not an equal distribution at all activities.



# Limitations

Other extended family member's time use is excluded

Only focuses on who did more, but not on how much more

## Direct Use

Weight in scheduling and time use allocation

## Further research

Expanding it to explore its impact, quantitatively, to one's well being, e.g. health, social-capita, social-exclusion etc.





# THANK YOU

## QUESTIONS?

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