Split household and smoking behavior of rural migrants in China

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Research article

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Abstract

Background: With Hukou constraints, a large proportion of rural migrants have to leave part of their family members stay at hometown, the split household may cause serious smoking abuse among rural migrants in destination cites.

Objective: This study aims to address the direct effect of split household on the smoking behavior, while sole migration, couple migration and family migration are incorporated to the explore the concise effect of differentiated split household forms.

Method: A unique and comprehensive database named Rural Urban Migration in China (RUMiC-2009) is applied to explore the association between split household and the smoking amounts of rural migrants; Analyses are conducted using the Chi-square tests/ ANOVA tests and multiple Tobit regression.

Results: The amounts of cigarettes consumed for the family migrants (0.1751±0.3757) are less than those sole migrants (0.2732±0.4218) and couple migrants (0.1892±0.3745). The couple migrants (Coefficient= -0.0575; 95% CI= -0.1378, 0.022717) and family migrants (Coefficient= -0.1313; 95% CI= -0.2127,-0.0498) smoke less than the sole migrants counterparts, but the coefficient of couple migrants is not significant.

Conclusions: Split household is associated with smoking abuse. Family migration has a significant effect on smoking control, while couple migration only produces insignificant negative influence on cigarettes consumption.

Background

China is a high-burden tobacco-use country, where nearly one-third (28.1%) of the population smokes, including 52.9% of men and 2.4% of women[1], which has been linked to the chronic and often fatal diseases of the respiratory tract[2]. With rapid urbanization, about 288 million migrants move from rural to urban in 2018 [3], and they have become an indispensable force for China’s industrialization and modernization [4]. However, a large part of them are highly susceptible to smoking [5–7]. A rich array of studies has explored the determinants of rural migrants’ smoking prevalence [8]. Most previous researches have consistently concluded that life and work stress are main determinants for the smoking prevalence of rural migrants[9, 10], where the life and work stress include but not are limited to low-quality employment, poor living conditions, unequal public service, maladaptation to urban life and so on [9, 10, 12–14]. The rural migrants with high stress are more prone to trigger and aggravate smoking to obtain temporarily release [7]. Beyond that, there is also a consistent conclusion that the rural migrants’ smoking prevalence is associated with age, gender, education attainments, income, occupation and migration durations[6–7, 15].

However, the existing studies neglect a fact that the rural-urban migration is not a one way street, and most of rural migrants are temporary or circular [16–17]. Rural migrants can move to a new place but are not easy to enjoy the equal public welfare as local urban citizens with Hukou constraints [14, 18]. Thus, a large proportion of them have to choose sole migration or couple migration, which leave part of their family members stay at hometown [19–22]. The split household is usually accompanied with solitude or psychological stress [23], which may induce to serious smoking abuse among rural migrants. Nevertheless, previous studies pay little attention to the association between split household and smoking behavior. Chen et al. (2004) found a negative correlation between living with relatives and the smoking prevalence [7], but their conclusion was drawn only through Pearson chi-square tests, without regression applied to conduct more robust results. Otherwise, Chen et al. (2004) use the smoking prevalence instead of the smoking amounts as proxy for smoking behavior, and it is insufficient to assess the effect of split household on smoking abuse of rural migrants.

The present study aims to fill those gaps by using a unique survey named RUMiC to extend the discussion of association between split household and smoking behavior among rural migrants in China. Three issues are addressed as follows:

(1) Does the split household induce to abuse smoking?

(2) Are there any differential effect among three split-household forms?
(3) Does the effect of split household on smoking behavior vary by gender?

This research contributes to the literature in three distinct ways. First, the present study emphasizes the direct effect of split household on the rural migrants’ smoking behavior in China context, and it presents new evidence to understand the nexus between the smoking abuse and solitude due to household split. Second, a unique and comprehensive database named RUMiC is used to explore the direct effect of split household, and the amount of smoking instead of the smoking prevalence is incorporated to discuss the association between split household and smoking abuse. Third, this research applies the Tobit regression to verify the relationship between split household and rural migrants’ smoking abuse, the gender differential is further addressed to explore the heterogeneity effect.

Method

Data and sample

This study used data from Rural Urban Migration in China (RUMiC), which is initiated by a group of researchers at the Australian National University, the University of Queensland and the Beijing Normal University and supported by IZA Institute of Labor Economics. RUMiC consists of three independent surveys: the Urban Household Survey (UHS), the Rural Household Survey (RHS) and the Migrant Household Survey (MHS). The data we applied in the present study is derived from MHS, which collects rich information on household roster and personal characteristics, education and training backgrounds, employment situation, household income and expenditure during migration period. RUMiC covers 15 cities within nine-largest provinces sending and receiving migrants in China (see Fig. 1). About 5000 migrant households were collected in each wave, and the sampling frame of MHS was conducted by RUMiC team to overcome the problem of under-coverage [24]. They established a list of 550,000 migrant workers, from which 5,000 samples were randomly selected for face-to-face interview [25]. RUMiC was launched in 2008, and three waves RUMiC-2008, RUMiC-2009, and RUMiC-2010 are available to apply. But only the wave of 2009 collects smoking-related information includes the amount of daily smoking and smoking history.

This study is limited to the rural migrants from nuclear family, which is only defined as a single family nucleus with married-couple and their young children(age ≤ 16). We also drop the incomplete nuclear family samples such as married-couple with no child and single parent family to ensure the specific split scenario portrayed as split between spouses as well as split between spouse and their children [22]. After deleting the missing samples and outliers, this study obtains 3520 valid migrant samples, which includes about 1892 males and 1628 females.

Ethnics Statement

This study is a secondary analysis based on the data from the RUMiC conducted by a group of researchers at the Australian National University, the University of Queensland and the Beijing Normal University and was supported by the Institute for the Study of Labor (IZA), all of which were subject to multiple stages of reviews by experts to address methodological, ethical and legal issues related to data collection. Final approvals of all RUMiC surveys were required from the Research Ethics Committee of National Bureau of Statistics of China to ensure that the data collection complied with ethical requirement according to the Statistics Act.

Measures

Split household includes three forms: sole migration, couple migration and family migration. Following Fan (2001) [22], we define the sole migration as the rural migrants who migrate solely, while both their spouse and children are left behind their hometown. Couple migration refers to migrants who migrate with their spouse but have no children migrating together. Family migration is the household with the couple and all the children migrating together.

Daily smoking amount is measured by pack of cigarettes consumed per day, which was calculated by the average cigarettes consumed per day / 20. The variable of average cigarettes consumed per day is directly collected form the questionnaire item “How many cigarettes on average do you smoke per day now?” To obtain a more specific smoking status, we also divide the
smoking addiction into five groups: Packet = 0, 0 < Packet ≤ 0.5, 0.5 < Packet ≤ 1, Packet > 1. The smoking prevalence is defined as a dummy variable, which is set equal to 1 if migrants smoke at least 1 cigarette per day and 0 otherwise.

According to previous studies, controlled variables incorporate age (years), gender (ref = female), educational attainment (years), health status (ref = poor), industry (ref = others), job status (ref = others), smoking history (years), life satisfaction (Likert scale).

**Modeling strategy**

All the Analyses are conducted using the Stata 15.0. The pearson chi-square tests and ANOVA tests are applied to examine the association between gender, split household and smoking behaviors, which include pack of cigarettes consumed per day, smoking addition and smoking prevalence.

Tobit regression analyses are performed to explore the direct effect of split household on the smoking amounts of rural migrants, while the demographic variables, employment traits as well as the smoking history and life satisfaction are incorporated as the controls. Two Tobit regressions also are separately conducted to discuss the heterogeneity effect by gender.

**Results**

**Baseline characteristics**

Table 1 presents the descriptive statistics, most of the rural migrants are young males, while the average age is about 35 years old, and 53.75% of them are males. The average educational attainment is nearly 9 years, which implies that most of them have completed the nine-year compulsory education. 79.6% of rural migrants report a good health status, and most of them are satisfied with the present life status. As for the employment status, half of them work in the retail and hotel industry, whereas 16.08% and 8.86% of them engage in manufacture and construction. 27% of them are self-employed, and the average income reached to 1902.8 one month.
The baseline characteristics by split household also reveal that migrants from different split household forms may show differentiated traits. 68.54% of sole migrants are males, while only about half of the couple migrants and family migrants are males. 52.86% of the family migrants are in self-employment, which is higher than the couple migrants (30.07%) and sole migrants (13.98%). The family migrants are more likely to engage in the retail (43.56%) comparing with the sole migrants (21.6%) and couple migrants (30.07%) counterparts. Sole migrants have a longer smoking history (5.45 ± 8.49) than couple migrants (4.01 ± 8.28) and family migrants (3.81 ± 8.45).

Univariate analysis

As show in Table 2, the average packet of cigarettes consumed per day is 0.2016, whereas 72.61% of the migrants are non-smoker. Among those smokers, only 1.42% of them smoke more than one packet daily, while 25.86% of them smoke within one packet.
## Table 2

### Univariate analysis

<table>
<thead>
<tr>
<th>Full sample</th>
<th>Gender</th>
<th>Split household</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male N(%)</td>
<td>Female N(%)</td>
</tr>
<tr>
<td>Smoking amounts Packet number consumed per day&lt;sup&gt;a&lt;/sup&gt; (Mean ± SD)</td>
<td>0.2016 ± 0.3881</td>
<td>0.3662 ± 0.4636</td>
</tr>
<tr>
<td>Smoking addition&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet = 0</td>
<td>2556(72.61)</td>
<td>955(50.48)</td>
</tr>
<tr>
<td>0 &lt; Packet ≤ 0.5</td>
<td>433(12.30)</td>
<td>417(22.04)</td>
</tr>
<tr>
<td>0.5 &lt; Packet ≤ 1</td>
<td>481(13.66)</td>
<td>470(24.84)</td>
</tr>
<tr>
<td>Packet &gt; 1</td>
<td>20(1.42)</td>
<td>50(2.64)</td>
</tr>
<tr>
<td>Smoking Prevalence&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>2556(72.61)</td>
<td>955(50.48)</td>
</tr>
<tr>
<td>Non-smoker</td>
<td>964(27.39)</td>
<td>937(49.52)</td>
</tr>
<tr>
<td>n</td>
<td>1892</td>
<td>1628</td>
</tr>
</tbody>
</table>

Note: <sup>a</sup> P-value were calculated using ANOVA tests; <sup>b</sup> P-value were calculated using Pearson chi-square tests

*significant (p ≤ 0.05)

The Chi-square tests and ANOVA tests also indicate that the males have more probability to smoke than females (50.48% vs 1.66%), meanwhile the average packet number of cigarettes consumed per day is 0.3662 ± 0.4636 for males, which is more than the females(0.0103 ± 0.0893). The smoking prevalence of family migrants (23.54%) is lower than the sole migrants (37.95%) and couple migrants(25.46%), while the amounts of cigarettes consumed among the family migrants(0.1751 ± 0.3757) are less than those sole migrants(0.2732 ± 0.4218) and couple migrants(0.1892 ± 0.3745). Additionally, among all the smokers, family migrants with one packets daily smoking(22.23%) is less than the couple migrant(24.30%) and sole migrant(35.96%) counterparts.

### Multivariate analysis

Multivariate analysis with Tobit regression model is applied to identify independent variables associated with amounts of current cigarette smoking, from which coefficient and 95% confidence intervals (CI) are calculated.
As shown in Table 3, the Tobit estimations reveal that age (Coefficient= -0.0178; 95% CI= -0.0246, -0.0110) and education attainments (Coefficient= -0.0078; 95% CI= -0.0220,0.0063) are negative related with the amounts of daily cigarette smoking, but the latter isn't statistically significant at 95% confidence level. Migrants of males (Coefficient = 1.0644; 95% CI = 0.9393, 1.1895) and being in good health status (Coefficient = 0.0818; 95% CI = 0.0052,0.1583) smoke more. Rural migrants engaged in the construction (Coefficient = 0.1060; 95% CI= -0.0014,0.2135), self-employed rural migrants (Coefficient = 0.0476; 95% CI= -0.0377,0.1329) and workers with higher income (Coefficient= -0.0104; 95% CI= -0.0770, 0.0563) are likely to smoke more, but all these coefficients are not significant. A significant positive effect are shown between smoking history (Coefficient = 0.0532;
95% CI = 0.0476, 0.0588) and the amounts of daily smoking, while the life satisfaction (Coefficient= -0.0956; 95% CI= -0.1394, -0.0517) is negatively associated with the daily smoking packets.

As for the effect of split household, the results show that the couple migrants (Coefficient= -0.0575; 95% CI= -0.1378, 0.022717) and family migrants (Coefficient= -0.1313; 95% CI= -0.2127, -0.0498) smoke less than the sole migrants counterparts, but the coefficient of couple migrants is not significant.

Considering the difference of daily smoking behavior between males and females, the Tobit regression model is stratified by gender. The results are shown in Table 4. The Tobit estimations for males reveal that age (Coefficient= -0.0178; 95% CI= -0.0246, -0.0110) and life satisfaction (Coefficient= -0.0960; 95% CI= -0.1419, -0.0501) have a significant negative effect on the amounts of daily smoking, while the health status (Coefficient = 0.0800; 95% CI = 0.0006, 0.1595) and smoking history (Coefficient = 0.0512; 95% CI = 0.0455, 0.0569) are positively significantly related with the packet number of cigarettes consumed per day. In the female sample estimation, only smoking history (Coefficient = 0.1144; 95% CI = 0.0747, 0.1541) produces a significant impact on the amount of daily smoking.
More importantly, the estimations of split household from the two sub-group sample models are robust with the full sample regression (As shown in Table 4). The results demonstrate that the family migrants smoke less than the sole migrant counterparts (male model: Coefficient= -0.1117; 95% CI= -0.1958, -0.0275; female model: Coefficient= -0.4062; 95% CI= -0.7805, -0.0320). Additionally, the estimations also show that couple migrants are also likely to smoke less than the sole migrants (male model: Coefficient= -0.0450; 95% CI= -0.1274, 0.0374; female model: Coefficient= -0.2108; 95% CI= -0.6412, 0.2197), but the effect is not significant at 95% confidence level.

### Discussion

The estimations from Tobit regression for full samples and subgroups both confirm that family migrants smoke less than sole migrants, which imply that family migration is beneficial for smoking control. The results in the full samples shows that the predicted value of smoking amounts is 0.1313 packets less for family migrants than for sole migrants, while in the male

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**Table 4**

Multiple Tobit regression analysis by gender

<table>
<thead>
<tr>
<th></th>
<th>Male (N=1892)</th>
<th></th>
<th>Female (N=1628)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>CI(95%)</td>
<td>p-value</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Split household</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sole migration (Reference group)</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Couple migration</td>
<td>-0.0450</td>
<td>(-0.1274,0.0374)</td>
<td>0.2850</td>
<td>-0.2108</td>
</tr>
<tr>
<td>Family migration</td>
<td>-0.1117</td>
<td>(-0.1958,0.0275)</td>
<td>0.0090</td>
<td>-0.4062</td>
</tr>
<tr>
<td>Age</td>
<td>-0.0178</td>
<td>(-0.0246,0.0110)</td>
<td>0.0000</td>
<td>-0.0237</td>
</tr>
<tr>
<td>Educational attainment(years)</td>
<td>-0.0092</td>
<td>(-0.0241,0.0056)</td>
<td>0.2240</td>
<td>-0.0073</td>
</tr>
<tr>
<td>Health status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor (Reference group)</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Good</td>
<td>0.0800</td>
<td>(0.0006,0.1595)</td>
<td>0.0480</td>
<td>0.0898</td>
</tr>
<tr>
<td>Income(Logarithm)</td>
<td>0.0003</td>
<td>(-0.0692,0.0699)</td>
<td>0.9920</td>
<td>-0.3175</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (Reference group)</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Construction</td>
<td>0.1114</td>
<td>(0.0029,0.2200)</td>
<td>0.0440</td>
<td>-0.2642</td>
</tr>
<tr>
<td>Manufacture</td>
<td>-0.0335</td>
<td>(-0.1345,0.0674)</td>
<td>0.5150</td>
<td>0.1696</td>
</tr>
<tr>
<td>Retail</td>
<td>0.0653</td>
<td>(-0.0341,0.1647)</td>
<td>0.1980</td>
<td>-0.1443</td>
</tr>
<tr>
<td>Hotel</td>
<td>0.0712</td>
<td>(-0.0319,0.1743)</td>
<td>0.1760</td>
<td>-0.0844</td>
</tr>
<tr>
<td>Job status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (Reference group)</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Self-employed</td>
<td>0.0337</td>
<td>(-0.0560,0.1233)</td>
<td>0.4610</td>
<td>0.2715</td>
</tr>
<tr>
<td>Smoking history(years)</td>
<td>0.0512</td>
<td>(0.0455,0.0569)</td>
<td>0.0000</td>
<td>0.1144</td>
</tr>
<tr>
<td>Life satisfaction(Likert scale)</td>
<td>-0.0960</td>
<td>(-0.1419,0.0501)</td>
<td>0.0000</td>
<td>-0.1316</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.6459</td>
<td>(0.0765,1.2153)</td>
<td>0.0260</td>
<td>1.5184</td>
</tr>
</tbody>
</table>
model, the estimation still demonstrate that the predicted value of smoking amounts is 0.117 packets less for family migrants than for sole migrants. The potential reason may be that migration pattern is significantly associated with loneliness[26], that is, migration with the whole family members together, especially migrated with their children together would boost their well-being[27]. Those would release the work and life stress, which may induce to a decrease of smoking addiction. Another possible reason is that with migrated children in the family, the male smokers would reduce the smoking abuse to maintain a good living environment for their children. The results also confirm that couple migration has a negative effect on amounts of smoking, but it is not significant. This may be because the incomplete family migration can partly weaker the smoking behavior, while leaving children stay behind has depressing impact[28], which would induce to abuse smoking to relieve loneliness for couples migrants.

In addition, the estimations also reveal that males smoke more than females, which is consistent with the previous studies confirming that rural male migrants are more likely to be smoker than females [7, 15]. For the rural male migrants, with a one year increase in smoking history, there is a 0.0512 packets increase in the predicted value of smoking amounts. With one unit increase in life satisfaction of males is associated with a 0.096 packets decrease in the predicted value of smoking amounts. This finding is consistent with Liu Z, Florkowski WJ and Chen H (2019) who also confirmed that migrants with higher life satisfaction are less likely to smoke [12]. The male migrants engaged in construction smoke more than the reference group, the predicted value of smoking amounts is 0.1114 packets more for family construction workers than for reference migrants. It is consistent with the general conclusion that smoking behavior is more prevalence among the construction rural workers [8].

Conclusion

This study discusses the direct effect of split household on rural migrants smoking behavior in China context by using a unique and comprehensive database named RUMIC. The results from Pearson chi-square tests and ANOVA tests shows that males have more probability to smoke than females, while the average packet number of cigarettes consumed per day is more than females. The amounts of cigarettes consumed for the family migrants are less than sole migrant and couple migrant counterparts. The estimations from Tobit regression confirm that family migrants and couple migrants smoke less than sole migrants, but the latter is not significant. The potential reason may be that family migration can improve the well-being of migrants, meanwhile the family responsibility also encourages the father to control smoking.

This study also sheds insight into current smoking control policy in urban China. Family migration is a valid way to weaken smoking addiction, thus it should be highly highlighted to attach importance to harmony and combination of all kinds of migration policy tools to encourage family migration.

Abbreviations

Rural Urban Migration in China (RUMiC); Odds ratios (OR); Confidence interval (CI)

Declarations

Ethics approval and consent to participate

Not applicable

Consent for Publication

Not applicable.

Availability of data and material

The RUMiC is available from the IZA upon reasonable research request. RUMiC can be requested from the website of IZA: https://datasets.iza.org/dataset/58/longitudinal-survey-on-rural-urban-migration-in-china
Competing interests

The authors declare that they have no competing interests.

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Authors’ contributions

Zicheng Wang took leadership and responsibility for the research activity planning and made substantial contributions to the conception and design of the Programme. Jiachun Liu worked on the statistical analysis of the data. Juan Ming drafted the concept of the paper as well as participated in finalizing the manuscript. All authors read and approved the final manuscript.

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References


Figures
Figure 1

Sampling map. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.