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Liquidity constraints and family labor participation

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ABSTRACT

This paper sheds light on the relationship between liquidity constraints experienced by the head of the household (HOH) and their family members' labor supply. The study, focusing on the spillover effects between financial and labor markets, finds that when the HOH is liquidity constrained, unemployed family members join the labor market. While the overall tendency of family members is to choose self-employment versus salaried employment, the results show a heterogeneous impact on different family members. We find the impact of liquidity constraints to be the strongest on the labor market decisions of the spouses and children. Using the China Household Finance Survey (CHFS), the study contributes to the literature by presenting evidence on intra-household risk-sharing from a big emerging market economy where the family ties are tightly knit.

KEYWORDS

Liquidity constraints; labor participation; labor supply; intra-household risk sharing; labor market; household behavior

JEL CLASSIFICATION:

G40; J21

1. Introduction

Within the context of the life-cycle/permanent income theory, Rossi and Trucchi (2016) find that workers supply additional labor to keep their consumption constant when they are faced with restrictions in financial markets. Their study provides evidence from Italy by using the Italian Survey of Households Income and Wealth. Discerning how individual behavior changes in response to a negative shock, the next question is how family members influence each other to change their behavior when the household is faced with a negative shock. The life-cycle model of family labor supply outlined by Stephens (2002) lays the groundwork for household behavior studies where labor adjustments are used as an intra-household risk-sharing mechanism to alleviate the impact of negative shocks. Nevertheless, the extant literature on family labor supply focuses on unemployment, which is a more severe shock (e.g., Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018). On the other hand, the impact of milder shocks, such as liquidity constraints, is still yet to be answered. Using the China Household Finance Survey (CHFS), our paper aims to fill this gap

in the literature by examining the relationship between liquidity constraints experienced by the head of the household (HOH) and the likelihood of unemployed family members to join the workforce.

Although family is the smallest unit in every society, the family systems' strength varies from country to country. Reher (1998) divides the western world into different areas according to the strength of families and family ties. Where family ties are weak, better health and social welfare help the elderly maintain their independence, children and women to acquire greater autonomy, and women to enter the labor market. Consistent with Reher (1998), using the European Union Statistics on Income and Living Conditions (EU-SILC) survey, which covers 28 European countries, Bredtmann, Otten, and Rulff (2018) show that women's labor supply in response to their husband's job loss varies over different welfare regimes. The authors explain that this result might be due to differences in unemployment benefit systems of different countries and that as a country's economy grows, women are more likely to enter the workforce or to extend working hours. Reher (1998) asserts that understanding these differences and the nature of family systems is crucial for the success of politicians and public planners when designing social policies.

While there is a vast literature on household responses to economic shocks, our study most closely relates to Rossi and Trucchi (2016), Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018). Rossi and Trucchi (2016) explain that the possibility of using labor supply both as a channel to overcome the binding effect of liquidity constraints and to achieve the desired level of consumption has been neglected in life-cycle saving literature. Thus, building a bridge between financial and labor markets, their study helps draw a more complete picture of the channels utilized to smooth out consumption. Our paper deviates from Rossi and Trucchi (2016) in that the prior study analyzes the behavior of the HOH or their spouse. In contrast, our unit of interest is the family as a whole. This allows us to not only explore the behavioral response to liquidity constraints but also to observe how family members influence each other and, thus, study intra-household risk-sharing. To that end, our paper extends the work of Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018). The main difference between our study and the previous two studies is the severity of the negative shock. In this paper, similar to Rossi and Trucchi (2016), we explore the impact of liquidity constraints, which is a milder shock than unemployment of the HOH analyzed in Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018).

Additionally, Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018) focus on the change in women's labor supply in response to husband's job loss, and Rossi and Trucchi (2016) focus on the change in men's labor supply. However, in this study, we investigate the labor supply of all family members in response to HOH's liquidity constraints, and more importantly, regardless of the gender. As per Cardia and Ng (2003) and Cardona-Sosa et al. (2018), we expect to see heterogeneity in the impact of HOH liquidity constraints on different family members' likelihood to join the workforce. Accordingly, we differentiate family members by isolating the impact on spouse, parents, and children.

Bredtmann, Otten, and Rulff (2018) also assert that previous studies analyzing the added worker effect focus on only women who did not participate in the labor

market before the negative shock while disregarding women who were already in the labor market and chose to extend their working hours. On the other hand, Bottazzi (2004) excludes self-employed households in their analyses. Yet, Giannetti (2011) asserts that liquidity constraints have an impact on households' occupational choice. Thus, in this study, we focus on both family members who choose to enter the labor market and those already in the market but choose to work longer hours. Regarding the employment types, our sample includes self-employed households in addition to households who are salaried-employees. More specifically, we explore the impact of HOH liquidity constraints on the family member(s)' likelihood of starting: (1) employment including salaried and self-employment (labor participation), (2) self-employment. The second category also includes households who are already salaried employees but start self-employment in addition to their current job in an effort to boost household income.

Our results show that when the HOH is liquidity constrained, family members are more likely to join the workforce. Among those family members who join the workforce, there is a higher tendency to choose self-employment. Finally, the HOH's liquidity constraints have a different impact on different family members residing with the HOH. The HOH liquidity constraints have a stronger impact on the labor market decisions of the spouses and children. To investigate the robustness of our results, we perform additional tests, including using: (1) an alternative interest rate of 4.35%, (2) a sample constructed of households without a mortgage, (3) instrumental variable approach, and (4) the urban sample only.

Our study, focusing on China, contributes to the literature by presenting evidence for the added worker effect from a big emerging market economy where the family ties are very strong. Our results showing how family members influence each other in this setting have important implications for policymakers who design social policies. While, Lee and Parasnis (2014) assert that labor force participation rate depends on the strength of the added worker effect and the discouraged worker effect, Cardona-Sosa et al. (2018) mention that little is known about the existence of the added worker effect in the case of developing economies.

2. Literature review

One way for households to smooth consumption over time is to adjust labor supply when household income varies due to negative shocks. Liquidity constraints (e.g., Del Boca and Lusardi 2003; Hajivassiliou and Ioannides 2007; Giannetti 2011; Rossi and Trucchi 2016), and unemployment (e.g., Ortigueira and Siassi 2013; Lee and Parasnis 2014; Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018), although varying in intensity, are among the many examples of negative shocks studied in the literature.

In the family setting, a negative shock such as the breadwinner's job loss may affect the unemployed secondary earners' decisions to enter the labor market or if they are already employed, to adjust the number of hours worked. When the decision is to increase labor supply, it is called the added worker effect (Lee and Parasnis 2014; Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018) and when it is to decrease labor supply, it is called the discouraged worker effect (Lee and Parasnis

2014). Lee and Parasnis (2014) find that while the discouraged worker effect is prevalent in developed countries, the added worker effect is prevalent in developing countries.

Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018) focus on marriage, where they analyze the unemployed spouse's behavioral response to their partner's job loss. Marriage functions as an intra-household risk-sharing mechanism in response to income shocks (Shore 2010; Ortigueira and Siassi 2013; Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018). With this aspect, marriage enables spousal labor supply to serve as an insurance mechanism against unemployment shocks (Ortigueira and Siassi 2013). Using the EU-SILC survey, which covers 28 European countries, Bredtmann, Otten, and Rulff (2018) find that the added worker effect varies over different welfare regimes. More specifically, the added worker effect is found to be the strongest in Mediterranean countries, and weaker in Continental European and Nordic countries. As for Anglo-Saxon countries, the added worker effect is negative. In Central and Eastern European countries, the limited demand in the labor market is driving the results. Namely, although women are willing to enter the labor market, they cannot find a job or even extend their working hours. The authors posit that the variation in results might be due to differences in unemployment benefit systems in different countries.

Consistent with prior literature, Cardona-Sosa et al. (2018), studying Colombia, show that when the HOH loses their job, the labor supply of wife increases by about 36 percent during the first six months. However, within a year, household members under college age are more likely to enter the labor market. The authors explain that limited access to credit markets, insufficient welfare programs, lack of unemployment insurance, lower income and savings levels, and limited access to education and training might be the driving factors of this phenomenon. Regarding savings levels, wealth is a factor affecting the household decision to increase labor supply (Hayashi 1985; Henley 2004; Ortigueira and Siassi 2013; van Huizen 2014). Ortigueira and Siassi (2013) show that, in the event of a negative shock, wealth-rich households use mainly savings to smooth consumption, whereas wealth-poor households rely on the other spouse's labor supply.

The cost of child care is another factor affecting the household decision to participate in the labor market (Ogawa and Ermisch 1996; Cardia and Ng 2003; Attanasio, Low, and Sanchez-Marcos 2008). Cardia and Ng (2003) extend the focus on the relationship between family dynamics and labor supply to include the intergenerational time and monetary transfers. They posit that grandparents' child care support helps younger generations by relieving their time constraints and allowing them to devote more time to work, increasing labor supply. In contrast, when grandparents make monetary transfers to their children, which translates into higher income, increasing savings and capital accumulation, the labor supply decreases.

A closely related strand of literature studies market spillover effects by focusing on the relationship between labor and financial markets (e.g., Del Boca and Lusardi 2003; Bottazzi 2004; Hajivassiliou and Ioannides 2007; Rossi and Trucchi 2016). Fortin (1995), Del Boca and Lusardi (2003), and Bottazzi (2004), focusing on the restrictions in the mortgage market, find mortgage use to be related to female

participation in the Canadian, Italian, and British labor markets respectively. However, mortgage use is not the only type of debt increasing labor supply. Bredtmann, Otten, and Rulff (2018) find that in households that have to repay non-housing-related debts, unemployed women are more likely to enter the labor market. Studying another type of financial market restriction, Rossi and Trucchi (2016) find that the intensity of men's labor increases with liquidity constraints. On average, men who face restrictions in the financial market smooth their consumption by working 4 hours more than their counterparts. Between different groups, self-employed workers, who, by the nature of their job, are more flexible in changing their labor supply intensity, tend to be more sensitive to liquidity constraints. Following this literature, we extend the work done in Bredtmann, Otten, and Rulff (2018) and Cardona-Sosa et al. (2018) by analyzing household members' labor supply decisions in response to a negative shock. However, similar to Rossi and Trucchi (2016), we analyze the impact of a milder negative shock, which is the HOH liquidity constraints. More specifically, our goal is to answer whether family members are more likely to participate in the workforce when the HOH is liquidity constrained.

3. Research methods

3.1. Data and variables

3.1.1. Data

Our data source is the China Household Finance Survey (CHFS), which is repeated nationwide biennially since 2011. Over the years, the content of the CHFS has been updated, and the sample size has increased. To maximize the number of observations yet employ the same questions to measure our variables and to use the fixed-effect estimator akin to Rossi and Trucchi (2016) and Cardona-Sosa et al. (2018), we create a panel dataset with the last two waves of the CHFS, that are 2015 and 2017. Except for permanent income calculation, the earliest wave in 2011 is excluded from our sample due to two reasons. First, the earliest wave has a limited number of observations. Second, since our study requires longitudinal data, we have to track the same individual throughout time, and thus, need to use repeated surveys, which further decreases our sample size. The only exception to this is the permanent income calculation, and labor participation and self-employment identification. Permanent income calculation uses all waves starting from 2011, and the labor participation and self-employment identification use waves beginning from 2013. Bredtmann, Otten, and Rulff (2018) use 16 as the lower household age limit in their sample. Rossi and Trucchi (2016) use the upper limit of 80 based on the assumption that households will live until 80. Thus, following the literature, our sample is restricted to households between 16 and 80 years of age. However, we use 76 years as the lifetime horizon in our permanent income calculation, as the World Bank reports the life expectancy at birth for China in 2017 as 76.47¹.

3.1.2. Variables

Throughout our regression analyses, we use either one of the two dependent variables: family member(s)' likelihood of starting (1) employment including salaried and

self-employment (labor participation), (2) self-employment. The second category also includes households who are already salaried employees but start self-employment in addition to their current job to boost household income.

The main independent variable of interest is the liquidity constraints of the HOH. According to Rossi and Trucchi (2016), an HOH is liquidity constrained when two conditions are jointly fulfilled: (1) permanent income exceeds current income, (2) financial assets are close to zero. While we can use the four waves of the CHFS from 2011 to 2017 for our permanent income calculation, we do not have complete information on financial assets in our dataset as some households do not report the exact number of financial assets. Thus, our definition of liquidity constraints partially follows Rossi and Trucchi (2016). That is, an HOH is liquidity constrained when their permanent income exceeds current income. To calculate permanent income, we use the model given in Rossi and Trucchi (2016), which is based on Deaton (1992):

$$y^p = \frac{r}{1+r} \left[1 - \frac{1}{(1+r)^{(T-t+1)}} \right]^{-1} [H_t + A_t] \quad (1)$$

Where, y^p is permanent income, r is the interest rate, T is the lifetime horizon equal to 76, t is the age of the household, H_t is the present value of the expected future labor income, and A_t is wealth which equals total assets minus liabilities.

While Rossi and Trucchi (2016) use 2% as the interest rate, the interest rate used in our main results is equal to 6.92% that is the average interest rate between 1980 and 2019 based on the lending interest rate for China reported by the World Bank. In robustness tests, we also use the most recent lending interest rate of 4.35% reported by the World Bank for China between 2015 and 2019².

Rossi and Trucchi (2016) assert that the measurement of expected future earnings is crucial for the permanent income variable. They assume that individuals form their earnings beliefs based on the earnings of reference individuals who are defined as workers with the same gender, education level observed in the last 10-year period and live in the same area as the survey respondent. Then the authors use the observed value of income for reference individuals to identify the expected value of earnings for each survey respondent. In this paper, we use a similar method to calculate the expected future earnings. Our reference groups are created based on age, education, gender, and province using the survey waves between 2011 and 2017.

In our regression analyses, we use a liquidity constraint dummy that takes the value of 1 when an individual is not liquidity constrained in the previous wave of the survey, but is liquidity constrained in the survey's current wave.

Employment (labor participation) is measured by labor market participation. Labor market participation occurs when an unemployed household is employed in the next time period. Self-employment is used to identify whether households start self-employment or extend working hours as a behavioral response to negative shocks. Both are dummy variables that take the value of 1 when an individual changes behavioral response between the two consecutive waves of the survey. The remaining control variables are mostly chosen from frequently used variables in literature. These are age (Bottazzi 2004; Rossi and Trucchi 2016; Bredtmann, Otten, and Rulff 2018), age

squared (Bottazzi 2004; Rossi and Trucchi 2016; Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018) scaled by 100, the number of children (Ogawa and Ermisch 1996; Bottazzi 2004; Henley 2004; Giannetti 2011; Rossi and Trucchi 2016; Bredtmann, Otten, and Rulff 2018) which is further divided into two variables as one child and two or more children (Rossi and Trucchi 2016), married (Henley 2004; Giannetti 2011; Rossi and Trucchi 2016; Bredtmann, Otten, and Rulff 2018) which is a dummy variable to identify marital status, the number of workers in the household (Giannetti 2011), whether the employed household member is female (Bottazzi 2004), education in years (Ogawa and Ermisch 1996; Del Boca and Lusardi 2003; Bottazzi 2004; Bredtmann, Otten, and Rulff 2018; Cardona-Sosa et al. 2018; Chiappori, Dias, and Meghir 2018), and wealth (Zeldes 1989; Giannetti 2011; Ortigueira and Siassi 2013). One may argue that the relationship between education and the decision to choose salaried employment versus self-employment can be nonlinear. Thus, we also use education squared in our analyses. Del Boca and Lusardi (2003) and Bredtmann, Otten, and Rulff (2018) find various forms of debt to be related to labor supply decisions. Thus, we include debt as a control variable in our analyses. Fortin (1995), Del Boca and Lusardi (2003), and Bottazzi (2004) find female labor participation to be related to mortgage use. Accordingly, robustness tests presented in Section 5.2 exclude households with a mortgage from our sample and reinvestigate the impact of liquidity constraints on labor participation and self-employment decisions. Finally, Feder et al. (1990) discuss the credit market's unique nature in rural China. To study the impact of rural versus urban dwelling, we include a control variable for living in rural areas, and in Section 5.4, we exclude households who live in rural areas. Table A.1 in the Appendix details our variables.

Table 1 presents summary statistics. Our total sample includes 38,808 observations. For each variable, Columns (1) to (5) report the number of observations, mean, standard deviation, minimum, and maximum values, respectively. Labor participation shows that 17.28% of the households change their employment status from unemployed to employed between the two consecutive waves of the survey. The self-employment category includes 7.77% of our sample. Liquidity constraints of HOH impact 8.96% of the sample. The average household age is 40, and our sample is restricted to households between 16 to 80 years of age. The number of workers in an average household is 3.8, where the highest number is 14. Average household education in years is about 9.8 and the maximum household education in years 22. Household net wealth is equal to RMB 686,869 and household debt is equal to RMB 45,158. Finally, 41.21% of our sample live in a rural area, and 8.20% of our sample have a mortgage.

Table 2 describes our sample. Columns (1) to (3) represent the different household member categories; parents, spouse, and children of the head of the HOH. The labor participation rate is 5.99% for parents, 14.24% for spouses, and 22.78% for children. 1.83% of parents, 6.61% of spouses, and 10.17% of children are self-employed. The percentage of employed household members who are female account for 64.65% of parents, 87.08% of spouses, and 44.47% of children. These statistics show that parents and spouses who are female are more likely to participate in the workforce when the HOH is faced with a liquidity constraint. The average age of parents, spouses, and children is 65, 48, and 29, respectively. The survey wave in 2015 includes 1,431 parents, 5,455 spouses, and 6,240 children. The survey wave in 2017 includes 2,558

Table 1. Summary Statistics.

Variables	Observations	Mean	SD	Min	Max
Labor Participation	30,171	0.1728	0.3781	0	1
Self-employment	38,802	0.0777	0.2676	0	1
Liquidity Constraints of HOH	38,808	0.0896	0.2857	0	1
Age	38,808	39.9603	15.4138	16	80
One Child	38,808	0.3421	0.4744	0	1
Two or More Children	38,808	0.1751	0.3800	0	1
Married	38,808	0.7025	0.4572	0	1
Number of Workers	38,808	3.8108	1.1878	1	14
Female	38,808	0.6372	0.4808	0	1
Education in Years	38,808	9.7655	4.7005	0	22
Net Wealth	38,808	686,869	1,303,374	0	9,583,000
Debt	38,808	45,158	116,962	0	800,000
Rural	38,808	0.4121	0.4922	0	1
Mortgage	38,808	0.0820	0.2744	0	1

This table reports summary statistics. Labor participation is a dummy variable equal to 1 when household employment status changes from unemployed to employed between two consecutive survey waves. Self-employment is a dummy variable equal to 1 when household member status changes from not self-employed to self-employed or the household member extends working hours between the two consecutive survey waves. Age is the household member's age in years. One child and two or more children are dummy variables to identify households with only one child and households with multiple children. Married is a dummy variable to identify households where the couple is married. Number of workers is the number of employed members in a household. Female is a dummy variable to identify whether the household member is a woman. Education in years is the number of years of education of the household member. Net Wealth is total assets minus liabilities. Debt is the total amount of household debt. Rural is a dummy variable to identify households who live in a rural area. Mortgage is a dummy variable to identify households with a mortgage. Table A.1 in the Appendix explains these variables in detail. For each variable, Columns (1) to (5) report number of observations, mean, standard deviation, minimum, and maximum values, respectively.

Table 2. Sample Description.

	(1) Parents	(2) Spouse	(3) Children
Labor Participation	5.99%	14.24%	22.78%
Self-employment	1.83%	6.61%	10.17%
Female	64.65%	87.08%	44.47%
Age	65.05	47.66	28.70
2015	1,431	5,455	6,240
2017	2,558	9,934	11,681
2015 – 2017	3,989	15,389	17,921

This table describes our sample. 2015 and 2017 detail the number of households in each household member category in each year, 2015-2017 is the sum of the number of households in 2015 and 2017 for each family member category. The remaining variable definitions are listed in Table A.1 in the Appendix.

parents, 9,934 spouses, and 11,681 children. The two waves 2015-2017 together include 3,989 parents, 15,389 spouses, and 17,921 children.

3.2. Models

Following Rossi and Trucchi (2016), the baseline model employed to study the relationship between liquidity constraints of the HOH and family labor supply is an OLS regression model.

$$Y_i = \alpha + \beta LiquidityConstraints_i + X_i\gamma + \varepsilon_i \quad (2)$$

Where, Y_i could either be family member's labor market participation or self-employment, $LiquidityConstraints_i$ is a dummy variable indicating whether the HOH

is liquidity constrained, X_i includes the control variables mentioned earlier in Section 3.1.

Like Hajivassiliou and Ioannides (2007), we also use a probit model to investigate the probability that a household member will participate in the labor market or take up self-employment.

$$Probit(Y_i|X_i) = Probit(\alpha + \beta LiquidityConstraints_i + X_i\gamma + \varepsilon_i > 0|X_i) \quad (3)$$

Nevertheless, the endogeneity concerns raised in Rossi and Trucchi (2016) can also apply to our OLS models. That is, one can argue that liquidity constraints and labor market participation might be correlated with unobserved household characteristics such as family culture, attitude towards work, consumption, and saving behavior. This unobserved heterogeneity can bias the regression estimates. On the other hand, these behavioral differences are likely to be fixed household traits that do not change over time. Thus, to alleviate the concerns of confounding variables, we use fixed effects regression models following the prior study.

$$Y_{it} = \alpha + \beta LiquidityConstraints_{it} + X_{it}\gamma + C_i + \varepsilon_{it} \quad (4)$$

Unlike the OLS and probit models, the fixed effects regression models do not include gender, education, and education squared as control variables since these characteristics are assumed to be constant over time.

4. Family labor supply

4.1. Family member participation in the workforce

This section analyzes the relationship between liquidity constraints of the HOH and labor market participation of family members. Table 3 presents the results. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results, respectively. The dependent variable is labor participation, and the main independent variable of interest is HOH's liquidity constraints. The results show that when the HOH is liquidity constrained, the family members are likely to join the workforce. Column (1) shows that the likelihood of family members to join the workforce will increase by 2.94% using the OLS model. Using the probit model in Column (2), we find that the marginal effect of liquidity constraints on family members is 2.54%. Lastly, using the fixed effects method in Column (3), HOH's liquidity constraints still have a positive significant impact on family members' decision to join the workforce, and the coefficient of this variable is 4.80%.

Next, we analyze the relationship between the HOH's liquidity constraints and the self-employment of family members. The results are detailed in Table 4. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results, respectively. The dependent variable is self-employment, and the main independent variable of interest is the liquidity constraints of the HOH. We find that when the HOH is liquidity constrained, family members are more likely to start self-employment. Liquidity constraints of the HOH increase the likelihood of family members to take

Table 3. Liquidity Constraints and Labor Market Participation of Family Members.

	(1) OLS	(2) Probit	(3) FE
Liquidity Constraints of HOH	0.0294*** (0.0072)	0.0254*** (0.0061)	0.0480*** (0.0142)
Age	0.0023** (0.0009)	0.0061*** (0.0010)	-0.0372*** (0.0127)
Age Square	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0004*** (0.0001)
One Child	-0.0178*** (0.0047)	-0.0199*** (0.0049)	0.0045 (0.0256)
Two or More Children	-0.0038 (0.0064)	-0.0057 (0.0064)	0.0113 (0.0353)
Married	-0.0300*** (0.0063)	-0.0315*** (0.0064)	-0.0769** (0.0339)
Number of Workers	0.0012 (0.0020)	0.0009 (0.0019)	-0.0079 (0.0113)
Female	-0.0299*** (0.0048)	-0.0242*** (0.0045)	
Education in Years	0.0040*** (0.0015)	0.0027 (0.0018)	
Education Square	-0.0004*** (0.0001)	-0.0003*** (0.0001)	
ln(Net Wealth)	0.0028*** (0.0007)	0.0034*** (0.0008)	0.0109*** (0.0030)
ln(Debt)	-0.0013*** (0.0004)	-0.0012*** (0.0004)	-0.0011 (0.0013)
Rural	0.0246*** (0.0049)	0.0232*** (0.0047)	
Constant	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes	
Obs	30,171	30,171	30,171
Adj. R-sq/Pseudo R-sq	0.0870	0.1000	0.0422

This table shows the results of the regression analyses of the relationship between liquidity constraints of the head of the household (HOH) and the labor market participation of family members. The dependent variable is labor participation. The main independent variable of interest is liquidity constraints of HOH. Table A.1 in the Appendix explains the variables in detail. ***, **, and * indicates significance at the 1% level, at the 5% level, and at the 10% level.

up self-employment by 8.06% in Column (1), 4.96% in Column (2), and 5.52% in Column (3). This is similar to the results in Rossi and Trucchi (2016), which find self-employed workers to be more sensitive to liquidity constraints. The prior study explains this result by asserting that self-employed individuals are more flexible in changing their labor supply than salaried employees. Our results confirm their implications.

4.2. Heterogeneity in family members' behavioral responses

Cardia and Ng (2003) and Cardona-Sosa et al. (2018) show that household members differ in their behavioral responses to negative shocks. Hence, we expect to see heterogeneity in the impact of HOH liquidity constraints on different family members' likelihood to join the workforce. Accordingly, we differentiate family members by isolating the impact on parents, spouses, and children. Table 5 presents the results of the regression analyses of the relationship between liquidity constraints of the HOH and labor market participation by the family member category. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results for the sample of parents. Columns (4), (5), and (6) report the OLS, the probit, and the fixed effects

Table 4. Liquidity Constraints and Self-employment of Family Members.

	(1) OLS	(2) Probit	(3) FE
Liquidity Constraints of HOH	0.0806*** (0.0062)	0.0496*** (0.0033)	0.0552*** (0.0091)
Age	0.0032*** (0.0006)	0.0072*** (0.0007)	-0.1569*** (0.0071)
Age Square	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0011*** (0.0001)
One Child	-0.0058* (0.0031)	-0.0086*** (0.0027)	0.0137 (0.0158)
Two or More Children	-0.0202*** (0.0041)	-0.0221*** (0.0036)	0.0162 (0.0231)
Married	0.0111*** (0.0042)	0.0081** (0.0037)	-0.0168 (0.0231)
Number of Workers	0.0056*** (0.0012)	0.0043*** (0.0010)	0.0052 (0.0071)
Female	-0.0353*** (0.0031)	-0.0269*** (0.0025)	
Education in Years	0.0085*** (0.0008)	0.0097*** (0.0011)	
Education Square	-0.0007*** (0.0000)	-0.0008*** (0.0001)	
ln(Net Wealth)	0.0034*** (0.0004)	0.0038*** (0.0005)	0.0054*** (0.0017)
ln(Debt)	-0.0013*** (0.0003)	-0.0011*** (0.0002)	-0.0009 (0.0008)
Rural	0.0064** (0.0031)	0.0047* (0.0025)	
Constant	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes	
Obs	38,802	38,802	38,802
Adj. R-sq/Pseudo R-sq	0.0424	0.089	0.1384

This table shows the results of the regression analyses of the relationship between liquidity constraints of the head of the household (HOH) and self-employment of family members. The dependent variable is self-employment. The main independent variable of interest is liquidity constraints of the HOH. [Table A.1](#) in the [Appendix](#) explains the variables in detail. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

model results for the sample of spouses. Columns (7), (8), and (9) report the OLS, the probit, and the fixed effects model results for the sample of children. The dependent variable is labor participation, and the main independent variable of interest is the liquidity constraints of the HOH. Column (2) shows that the HOH’s liquidity constraints have a positive effect on the HOH’s parents’ decisions to participate in the workforce. However, this result seems to be marginally significant. In the case of spouses and children, we get stronger results. Columns (4), (5), (7), and (8) show a positive relationship between the liquidity constraints of the HOH and HOH’s spouse or children’s decision to participate in the workforce, and these results are significant at the 1% level. The fixed effects models show a significant positive result for only the sample of children and not for the sample of spouses.

The literature investigating the family labor supply in response to a more severe shock, such as the HOH unemployment, finds a significant increase in the labor supply of the female partner. [Bredtmann, Otten, and Rulff \(2018\)](#) document a 10% increase for Mediterranean countries, whereas [Cardona-Sosa et al. \(2018\)](#) document a 36% increase for Colombia. Since our study focuses on a milder shock such as the liquidity constraint, we suspect an increase, even if it may not be as high in magnitude, might be more prevalent in a subcategory of employment such as self-

Table 5. Liquidity Constraints and Labor Market Participation by Family Member Category.

	Parents Sample			Spouse Sample			Children Sample		
	(1) OLS	(2) Probit	(3) FE	(4) OLS	(5) Probit	(6) FE	(7) OLS	(8) Probit	(9) FE
Liquidity Constraints of HOH	0.0255 (0.0172)	0.0172* (0.0104)	0.0217 (0.0272)	0.0489*** (0.0111)	0.0430*** (0.0091)	0.0233 (0.0214)	0.0489*** (0.0117)	0.0452*** (0.0107)	0.0457* (0.0239)
Age	-0.0038 (0.0045)	0.0010 (0.0022)	0.0191 (0.0411)	-0.0009 (0.0021)	0.0025 (0.0023)	-0.1626*** (0.0261)	0.0119*** (0.0028)	0.0150*** (0.0038)	0.1584*** (0.0318)
Age Square	0.0000 (0.0000)	-0.0000 (0.0000)	-0.0001 (0.0003)	-0.0000* (0.0000)	-0.0001** (0.0000)	0.0012** (0.0003)	-0.0002*** (0.0000)	-0.0003*** (0.0001)	-0.0042*** (0.0006)
One Child	-0.0189** (0.0093)	-0.0181** (0.0079)	-0.0420 (0.0582)	-0.0241*** (0.0073)	-0.0227*** (0.0073)	0.0223 (0.0346)	-0.0032 (0.0094)	-0.0033 (0.0096)	0.0293 (0.0488)
Two or More Children	-0.0096 (0.0124)	-0.0091 (0.0097)	-0.0105 (0.0748)	-0.0168 (0.0103)	-0.0160 (0.0098)	0.0731 (0.0492)	-0.0151 (0.0122)	-0.0156 (0.0125)	-0.0239 (0.0648)
Married	0.0027 (0.0091)	0.0008 (0.0088)	0.0003 (0.0334)	-0.0166 (0.0364)	-0.0091 (0.0283)	0.1802 (0.1624)	-0.0376*** (0.0106)	-0.0394*** (0.0106)	-0.1521*** (0.0499)
Number of Workers	-0.0006 (0.0044)	-0.0002 (0.0037)	0.0130 (0.0302)	0.0052 (0.0036)	0.0041 (0.0033)	-0.0101 (0.0156)	0.0076** (0.0038)	0.0076** (0.0038)	-0.0017 (0.0244)
Female	-0.0245** (0.0097)	-0.0227*** (0.0076)	-0.0420 (0.0076)	-0.0782*** (0.0109)	-0.0720*** (0.0093)		-0.0229*** (0.0073)	-0.0228*** (0.0074)	
Education in Years	0.0032 (0.0025)	0.0026 (0.0022)	0.0101*** (0.0021)	0.0101*** (0.0021)	0.0108*** (0.0024)		-0.0015 (0.0043)	-0.0013 (0.0044)	
Education Square	-0.0003* (0.0002)	-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0010*** (0.0001)	-0.0011*** (0.0001)		-0.0002 (0.0002)	-0.0002 (0.0002)	
ln(Net Wealth)	0.0037*** (0.0012)	0.0045*** (0.0018)	0.0002 (0.0021)	0.0024** (0.0011)	0.0027** (0.0013)	0.0028 (0.0047)	0.0068*** (0.0012)	0.0077*** (0.0014)	0.0186*** (0.0053)
ln(Debt)	-0.0004 (0.0007)	-0.0004 (0.0006)	0.0017 (0.0025)	-0.0014** (0.0006)	-0.0013** (0.0006)	-0.0005 (0.0019)	-0.0020*** (0.0007)	-0.0020*** (0.0007)	-0.0027 (0.0022)
Rural	0.0405*** (0.0106)	0.0377*** (0.0082)		0.0048 (0.0080)	0.0047 (0.0074)		0.0308*** (0.0081)	0.0302*** (0.0080)	
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	3,457	3,404	3,457	11,985	11,985	11,985	13,634	13,634	13,634
Adj. R-sq/ Pseudo R-sq	0.0264	0.0848	0.0044	0.0313	0.0443	0.0396	0.0181	0.0205	0.0881

This table shows the results of the regression analyses of the relationship between liquidity constraints of the head of the household (HOH) and labor market participation by family member category. The dependent variable is labor participation. The main independent variable of interest is liquidity constraints of HOH. Table A.1 in the Appendix explains the variables in detail. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

employment that is more sensitive to liquidity constraints as suggested by Rossi and Trucchi (2016). Thus, we repeat our tests to analyze the relationship between the HOH's liquidity constraints and self-employment by the family member category. Table 6 presents the results. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results for the sample of parents. Columns (4), (5), and (6) report the OLS, the probit, and the fixed effects model results for the sample of spouses. Columns (7), (8), and (9) report the OLS, the probit, and the fixed effects model results for the sample of children. The dependent variable is self-employment, and the main independent variable of interest is the liquidity constraints of the HOH. Columns (4), (5), (6), (7), (8), and (9) show a significant positive relationship between the liquidity constraints of the HOH and the HOH's spouse or children's decision to start self-employment. However, we get mixed results for the parents category. Columns (1) and (2) show a positive relationship between the liquidity constraints of the HOH and HOH's parents' decision to start self-employment, while Column (3) shows that there is no significant relationship. However, our results for the spouse sample show an increase of 3.35%, which is consistent with the literature documenting a positive increase and in line with our expectation of a lower magnitude in response to a milder shock.

5. Robustness tests

5.1. Lower interest rate

In our main analyses, the permanent income calculation uses the average interest rate of 6.92% that is calculated by averaging the lending interest rates reported by the World Bank for China between 1980 and 2019. However, the lending interest rate in China has been at its lowest levels since the year 2015. The rate which peaked at 12.06% in 1995, has been at a steady level of 4.35% between 2015 and 2019. Since our panel dataset is constructed using the last two waves of the CHFS in 2015 and 2017, in this section, we repeat our analyses using the lower interest rate of 4.35% in our permanent income calculation. Table 7 reports the results. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results analyzing the relationship between liquidity constraints of the HOH and labor market participation of family members. Similarly, Columns (4), (5), and (6) report the OLS, the probit, and the fixed effects model results analyzing the relationship between the liquidity constraints of the HOH and self-employment of family members. In Columns (1), (2), and (3), the dependent variable is labor participation. In Columns (4), (5), and (6), the dependent variable is self-employment. The main independent variable of interest is the liquidity constraints of the HOH. The variable liquidity constraints of the HOH has positive and significant coefficients in Columns (1) to (6). Namely, our results continue to hold at the most recent lower interest rate.

5.2. Non-housing related debts

Fortin (1995), Del Boca and Lusardi (2003), and Bottazzi (2004) study female labor market participation in Canada, Italy, and Britain, respectively. All three studies find

Table 6. Liquidity Constraints and Self-employment by Family Member Category.

	Parents Sample			Spouse Sample			Children Sample		
	(1) OLS	(2) Probit	(3) FE	(4) OLS	(5) Probit	(6) FE	(7) OLS	(8) Probit	(9) FE
Liquidity Constraints of HOH	0.0245** (0.0114)	0.0115*** (0.0042)	0.0117 (0.0109)	0.0589*** (0.0090)	0.0376*** (0.0050)	0.0335** (0.0138)	0.1052*** (0.0101)	0.0723*** (0.0061)	0.0790*** (0.0151)
Age	-0.0025 (0.0024)	0.0009 (0.0009)	-0.0115 (0.0222)	0.0032*** (0.0012)	0.0072*** (0.0014)	-0.1642*** (0.0163)	0.0108*** (0.0017)	0.0122*** (0.0024)	-0.0248 (0.0201)
Age Square	0.0000 (0.0000)	-0.0000* (0.0000)	0.0000 (0.0002)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0010*** (0.0002)	-0.0002*** (0.0000)	-0.0002*** (0.0000)	-0.0016*** (0.0004)
One Child	-0.0034 (0.0050)	-0.0024 (0.0033)	0.0015 (0.0070)	-0.0187*** (0.0046)	-0.0159*** (0.0039)	0.0299 (0.0226)	0.0023 (0.0059)	0.0018 (0.0055)	0.0112 (0.0287)
Two or More Children	-0.0092 (0.0064)	-0.0044 (0.0043)	0.0273 (0.0188)	-0.0269*** (0.0058)	-0.0236*** (0.0055)	0.0817** (0.0330)	-0.0228*** (0.0079)	-0.0208*** (0.0071)	-0.0086 (0.0415)
Married	0.0072* (0.0041)	0.0081* (0.0042)	-0.0052 (0.0078)	-0.0131 (0.0064)	-0.0107 (0.0135)	0.0496 (0.1200)	0.0026 (0.0068)	0.0011 (0.0060)	-0.0302 (0.0327)
Number of Workers	-0.0021 (0.0021)	-0.0016 (0.0016)	-0.0013 (0.0170)	0.0064*** (0.0022)	0.0042** (0.0017)	-0.0023 (0.0105)	0.0086*** (0.0024)	0.0078*** (0.0020)	0.0103 (0.0141)
Female	-0.0132** (0.0052)	-0.0093*** (0.0032)		-0.0612*** (0.0075)	-0.0450*** (0.0046)		-0.0255*** (0.0045)	-0.0242*** (0.0043)	
Education in Years	0.0010 (0.0013)	0.0009 (0.0011)		0.0074*** (0.0012)	0.0078*** (0.0014)		0.0082*** (0.0028)	0.0122*** (0.0027)	
Education Square	-0.0001 (0.0001)	-0.0001 (0.0001)		-0.0007*** (0.0001)	-0.0007*** (0.0001)		-0.0008*** (0.0001)	-0.0010*** (0.0001)	
ln(Net Wealth)	0.0002 (0.0007)	0.0003 (0.0006)	0.0008 (0.0008)	0.0035*** (0.0006)	0.0043*** (0.0008)	0.0028 (0.0026)	0.0042*** (0.0006)	0.0051*** (0.0009)	0.0079*** (0.0028)
ln(Debt)	-0.0004 (0.0004)	-0.0003 (0.0003)	0.0019 (0.0013)	-0.0010*** (0.0004)	-0.0008*** (0.0003)	0.0001 (0.0013)	-0.0016*** (0.0004)	-0.0015*** (0.0004)	-0.0010 (0.0014)
Rural	0.0046 (0.0054)	0.0042 (0.0035)		-0.0131*** (0.0050)	-0.0108*** (0.0041)		0.0178*** (0.0050)	0.0153*** (0.0045)	
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes		Yes	Yes		Yes	Yes	
Obs	3,989	3,472	3,989	15,386	15,386	15,386	17,918	17,918	17,918
Adj. R-sq/ Pseudo R-sq	0.0186	0.1328	0.0099	0.0347	0.0839	0.1163	0.0445	0.073	0.2147

This table shows the results of the regression analyses of the relationship between liquidity constraints of the head of the household (HOH) and self-employment by family member category. The dependent variable is self-employment. The main independent variable of interest is liquidity constraints of the HOH. Table A.1 in the Appendix explains the variables in detail. ***, ***, * indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 7. Robustness Test: Alternative Interest Rate of 4.35%.

	Labor Participation			Self-employment		
	(1) OLS	(2) Probit	(3) FE	(4) OLS	(5) Probit	(6) FE
Liquidity Constraints of HOH	0.0472*** (0.0074)	0.0421*** (0.0063)	0.0435*** (0.0145)	0.0765*** (0.0062)	0.0478*** (0.0034)	0.0549*** (0.0091)
Age	0.0013 (0.0009)	0.0055*** (0.0011)	-0.0938*** (0.0109)	0.0032*** (0.0006)	0.0072*** (0.0007)	-0.1573*** (0.0072)
Age Square	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0006*** (0.0001)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0011*** (0.0001)
One Child	-0.0198*** (0.0048)	-0.0227*** (0.0050)	-0.0009 (0.0255)	-0.0057* (0.0031)	-0.0086*** (0.0027)	0.0096 (0.160)
Two or More Children	-0.0207*** (0.0065)	-0.0234*** (0.0066)	-0.0067 (0.0355)	-0.0205*** (0.0041)	-0.0226*** (0.0036)	0.0147 (0.0230)
Married	-0.0172*** (0.0066)	-0.0175*** (0.0067)	-0.0676* (0.0348)	0.0117*** (0.0042)	0.0085** (0.0037)	-0.0152 (0.0233)
Number of Workers	0.0045** (0.0021)	0.0044** (0.0020)	-0.0038 (0.0113)	0.0056*** (0.0012)	0.0044*** (0.0010)	0.0059 (0.0072)
Female	-0.0351*** (0.0049)	-0.0308*** (0.0046)		-0.0354*** (0.0031)	-0.0267*** (0.0025)	
Education in Years	0.0047*** (0.0015)	0.0042** (0.0018)		0.0085*** (0.0008)	0.0097*** (0.0011)	
Education Square	-0.0005*** (0.0001)	-0.0005*** (0.0001)		-0.0007*** (0.0000)	-0.0008*** (0.0001)	
ln(Net Wealth)	0.0045*** (0.0007)	0.0048*** (0.0008)	0.0113*** (0.0030)	0.0036*** (0.0004)	0.0039*** (0.0005)	0.0059*** (0.0017)
ln(Debt)	-0.0017*** (0.0004)	-0.0017*** (0.0004)	-0.0013 (0.0013)	-0.0013*** (0.0003)	-0.0011*** (0.0002)	-0.0008 (0.0008)
Rural	0.0251*** (0.0051)	0.0240*** (0.0048)		0.0063** (0.0031)	0.0045* (0.0025)	
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes		Yes	Yes	
Obs	30,190	30,190	30,190	38,783	38,783	38,783
Adj. R-sq/Pseudo R-sq	0.0409	0.0511	0.0358	0.0420	0.0889	0.1383

This table shows the results of our robustness test, which uses an alternative interest rate of 4.35% in permanent income calculation. The dependent variable is labor participation in the first three columns, and self-employment in the last three columns. The main independent variable of interest is liquidity constraints of the HOH. Table A.1 in the Appendix explains the variables in detail. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

female labor market participation to be related to mortgage use. Our main regression analyses include all household debts, including mortgage as a control variable when investigating the relationship between the HOH liquidity constraint and his or her family members' labor market decisions. However, since mortgage is a significant component of household debts, in this section, we exclude households with a mortgage from our sample. Like Bredtmann, Otten, and Rulff (2018), we focus on only the households that have non-housing related debt obligations. Table 8 reports the results of our analyses. Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results analyzing the relationship between liquidity constraints of the HOH and labor market participation of family members. Columns (4), (5), and (6) report the OLS, the probit, and the fixed effects model results analyzing the relationship between the liquidity constraints of the HOH and self-employment of family members. In Columns (1), (2), and (3), the dependent variable is labor participation. In Columns (4), (5), and (6), the dependent variable is self-employment. The main independent variable of interest is the liquidity constraints of the HOH. We find that

Table 8. Robustness Test: Non-housing Related Debts.

	Labor Participation			Self-employment		
	(1) OLS	(2) Probit	(3) FE	(4) OLS	(5) Probit	(6) FE
Liquidity Constraints of HOH	0.0307*** (0.0077)	0.0263*** (0.0065)	0.0477*** (0.0158)	0.0538*** (0.0063)	0.0164*** (0.0020)	0.0605*** (0.0100)
Age	0.0025*** (0.0009)	0.0063*** (0.0011)	-0.0427*** (0.0135)	0.0044*** (0.0006)	0.0052*** (0.0004)	-0.0797*** (0.0088)
Age Square	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0004*** (0.0001)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0008*** (0.0001)
One Child	-0.0155*** (0.0050)	-0.0178*** (0.0052)	-0.0168 (0.0283)	-0.0007 (0.0031)	-0.0018 (0.0016)	0.0061 (0.0170)
Two or More Children	-0.0033 (0.0067)	-0.0044 (0.0068)	-0.0110 (0.0389)	-0.0022 (0.0040)	-0.0030 (0.0021)	0.0264 (0.0239)
Married	-0.0283*** (0.0066)	-0.0300*** (0.0068)	-0.0796** (0.0357)	-0.0016 (0.0041)	-0.0018 (0.0021)	-0.0295 (0.0236)
Number of Workers	-0.0002 (0.0021)	-0.0005 (0.0021)	-0.0060 (0.0120)	0.0006 (0.0012)	0.0001 (0.0006)	-0.0000 (0.0071)
Female	-0.0302*** (0.0050)	-0.0244*** (0.0047)		-0.0335*** (0.0031)	-0.0156*** (0.0015)	
Education in Years	0.0037** (0.0016)	0.0024 (0.0019)		0.0087*** (0.0009)	0.0054*** (0.0007)	
Education Square	-0.0004*** (0.0001)	-0.0003*** (0.0001)		-0.0007*** (0.0000)	-0.0004*** (0.0000)	
ln(Net Wealth)	0.0032*** (0.0008)	0.0040*** (0.0009)	0.0107*** (0.0033)	0.0013*** (0.0004)	0.0014*** (0.0003)	0.0050*** (0.0018)
ln(Debt)	-0.0003 (0.0005)	-0.0002 (0.0005)	-0.0002 (0.0015)	-0.0004 (0.0003)	-0.0001 (0.0001)	-0.0002 (0.0010)
Rural	0.0234*** (0.0051)	0.0225*** (0.0050)		0.0038 (0.0031)	0.0014 (0.0015)	
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes		Yes	Yes	
Obs	27,547	27,547	27,547	35,620	35,620	35,620
Adj. R-sq/Pseudo R-sq	0.0895	0.1016	0.0460	0.1540	0.2943	0.1749

This table shows the results of our robustness test, which excludes households with a mortgage from our sample. The dependent variable is labor participation in the first three columns, and self-employment in the last three columns. The main independent variable of interest is liquidity constraints of the HOH. Table A.1 in the Appendix explains the variables in detail. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

the coefficient of the HOH's liquidity constraints is still positive and significant. Namely, our results are robust to the exclusion of households with mortgage debts.

5.3. Instrumental variable approach

In this section, we return to our discussion of endogeneity in Section 3.2. Rossi and Trucchi (2016) assert that endogeneity concerns may also arise due to factors that change over time and that reverse causality may also be an issue. Since the proxy they use to account for credit constraints in their labor supply equations is open to bias, they employ an instrumental variable approach to overcome these issues. Similarly, we utilize the instrumental variable (IV) approach where the IV is the mean value of the liquidity constraints of other HOH in the community.

Table 9 reports our results. Column (1) reports the 2SLS model results, and Column (2) reports the IV fixed effects model results analyzing the relationship between liquidity constraints of the HOH and labor market participation of family members. Column (3) reports the 2SLS model results, and Column (4) reports the IV fixed effects model results analyzing the relationship between liquidity constraints of

Table 9. Robustness Test: Instrumental Variable Approach.

	Labor Participation		Self-employment	
	(1) 2SLS	(2) FE 2SLS	(3) 2SLS	(4) FE 2SLS
Liquidity Constraints of HOH	0.2308*** (0.0261)	0.2832*** (0.0432)	0.2683*** (0.0217)	0.2221*** (0.0261)
Age	0.0017* (0.0009)	-0.0394*** (0.0131)	0.0041*** (0.0006)	-0.0766*** (0.0083)
Age Square	-0.0001*** (0.0000)	0.0004*** (0.0001)	-0.0001*** (0.0000)	0.0008*** (0.0001)
One Child	-0.0187*** (0.0048)	0.0081 (0.0255)	-0.0029 (0.0030)	0.0156 (0.0159)
Two or More Children	-0.0055 (0.0065)	0.0083 (0.0352)	-0.0024 (0.0040)	0.0365* (0.0220)
Married	-0.0313*** (0.0064)	-0.0897*** (0.0342)	-0.0014 (0.0040)	-0.0335 (0.0214)
Number of Workers	0.0021 (0.0021)	0.0006 (0.0111)	0.0020 (0.0012)	0.0057 (0.0069)
Female	-0.0271*** (0.0049)		-0.0317*** (0.0030)	
Education in Years	0.0040*** (0.0015)		0.0082*** (0.0009)	
Education Square	-0.0004*** (0.0001)		-0.0007*** (0.0000)	
ln(Net Wealth)	0.0003 (0.0008)	0.0018 (0.0033)	-0.0012*** (0.0004)	-0.0009 (0.0020)
ln(Debt)	-0.0017*** (0.0004)	-0.0014 (0.0013)	-0.0014*** (0.0003)	-0.0012 (0.0008)
Rural	0.0162*** (0.0051)		0.0007 (0.0030)	
Constant	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes		Yes	
F value at First-stage	1,652.72	1,652.72	1,714.96	1,714.96
Cragg-Donald Wald F	2,714.20	2,714.20	3,272.00	3,272.00
Obs	30,171	30,171	38,802	38,802
Adj. R-sq	0.0588	0.0278	0.0966	0.0152

This table shows the results of an instrumental variable (IV) approach employed to address potential endogeneity concerns about our liquidity constraints variable, which we calculate following Rossi and Trucchi (2016). Rossi and Trucchi (2016) assert that due to factors that change with time, the proxy they use to account for credit constraints in their labor supply equations is open to endogeneity bias and that they employ an instrumental variable approach to overcome this issue. The dependent variable is labor participation in the first two columns, and self-employment in the last two columns. The main independent variable of interest is liquidity constraints of the HOH. Table A.1 in the Appendix explains the variables in detail. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

the HOH and self-employment of family members. In Columns (1) and (2), the dependent variable is labor participation. In Columns (3) and (4), the dependent variable is self-employment. The main independent variable of interest is the liquidity constraints of the HOH. In line with our main results, we find the impact of the HOH’s liquidity constraints on labor participation and self-employment of household members to be positive and significant.

5.4. Urban sample

Feder et al. (1990) study the relationship between credit and productivity in Chinese agriculture. The authors assert that, when faced with liquidity constraints, farmers living in rural areas would have to maintain savings to facilitate production and

Table 10. Robustness Test: Urban Sample.

	Labor Participation			Self-employment		
	(1) OLS	(2) Probit	(3) FE	(4) OLS	(5) Probit	(6) FE
Liquidity Constraints of HOH	0.0190** (0.0092)	0.0176** (0.0079)	0.0379** (0.0179)	0.0327*** (0.0072)	0.0119*** (0.0025)	0.0546*** (0.0112)
Age	0.0041*** (0.0011)	0.0087*** (0.0013)	-0.0038 (0.0140)	0.0066*** (0.0007)	0.0061*** (0.0005)	-0.0364*** (0.0074)
Age Square	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0000 (0.0001)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	0.0003*** (0.0001)
One Child	-0.0167*** (0.0057)	-0.0199*** (0.0059)	0.0519* (0.0305)	-0.0004 (0.0037)	-0.0021 (0.0019)	0.0334* (0.0198)
Two or More Children	-0.0026 (0.0086)	-0.0062 (0.0085)	0.0299 (0.0461)	0.0030 (0.0054)	0.0001 (0.0028)	0.0415 (0.0300)
Married	-0.0401*** (0.0081)	-0.0421*** (0.0081)	-0.1134** (0.0453)	-0.0029 (0.0048)	-0.0024 (0.0028)	-0.0315 (0.0274)
Number of Workers	0.0038 (0.0026)	0.0036 (0.0025)	-0.0164 (0.0148)	0.0011 (0.0015)	0.0008 (0.0007)	0.0008 (0.0094)
Female	-0.0239*** (0.0059)	-0.0197*** (0.0054)		-0.0246*** (0.0036)	-0.0128*** (0.0019)	
Education in Years	0.0018 (0.0019)	-0.0002 (0.0024)		0.0060*** (0.0012)	0.0040*** (0.0009)	
Education Square	-0.0004*** (0.0001)	-0.0003** (0.0001)		-0.0006*** (0.0001)	-0.0004*** (0.0000)	
ln(Net Wealth)	0.0025*** (0.0009)	0.0031*** (0.0011)	0.0090** (0.0039)	0.0006 (0.0005)	0.0006 (0.0004)	0.0030 (0.0024)
ln(Debt)	-0.0012** (0.0005)	-0.0011** (0.0005)	-0.0019 (0.0015)	-0.0008*** (0.0003)	-0.0003* (0.0002)	-0.0011 (0.0010)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effect	Yes	Yes		Yes	Yes	
Obs	18,653	18,653	18,653	22,809	22,809	22,809
Adj. R-sq/Pseudo R-sq	0.0684	0.0872	0.0325	0.1243	0.2655	0.1336

This table shows the results of our robustness test, which excludes households who live in rural areas. The dependent variable is labor participation in the first three columns, and self-employment in the last three columns. The main independent variable of interest is liquidity constraints of the HOH. [Table A.1](#) in the [Appendix](#) explains these variables in detail. ***indicates significance at the 1% level, **at the 5% level, and *at the 10% level.

consumption in the next cycle. Thus, easy access to credit markets increases farmers' output. Due to the unique nature of the rural sample, in this section, we exclude the rural sample and run our tests separately for urban locations. The results are presented in [Table 10](#). Columns (1), (2), and (3) report the OLS, the probit, and the fixed effects model results analyzing the relationship between liquidity constraints of the HOH and labor market participation of family members living in urban areas. Columns (4), (5), and (6) report the OLS, the probit, and the fixed effects model results analyzing the relationship between the liquidity constraints of the HOH and self-employment of family members living in urban areas. In Columns (1), (2), and (3), the dependent variable is labor participation. In Columns (4), (5), and (6), the dependent variable is self-employment. The main independent variable of interest is the liquidity constraints of the HOH. Our results continue to hold for the urban sample.

6. Conclusion

Family is the smallest unit of every society. Yet, family dynamics vary considerably in different cultures. Reher (1998) posits that understanding these differences is pivotal

for the success of politicians and public planners when designing social policies. He divides the western world into different regions based on the strength of families and family ties. Regions characterized by weaker family ties have better health and social welfare that help seniors to maintain their independence, and children and women to acquire greater autonomy and women to participate in the labor market. Bredtmann, Otten, and Rulff (2018) provide empirical support for this postulation in their study, where they analyze 28 European countries using the EU-SILC survey. Focusing on intra-household risk-sharing and how family members influence each other in the context of married couples, the study finds that women's labor supply in response to their husband's job loss varies over different welfare regimes. Bredtmann, Otten, and Rulff (2018) assert that as a country's economy grows, women are more likely to enter the workforce or to extend working hours. Nonetheless, the literature lacks empirical studies that can help us understand how these dynamics come into play in the case of developing economies (Cardona-Sosa et al. 2018).

Our study fills this gap in the literature by providing empirical evidence from China, a big emerging market economy where the family ties are very strong. Consequently, our results showing how family members impact each other when faced with a negative welfare shock have important implications for policymakers designing social policies.

Focusing on the relationship between the HOH's liquidity constraints and different family members' behavioral response to this negative welfare shock, we find that when the HOH is liquidity constrained, family members are more likely to join the workforce. Among those family members who join the workforce, there is a higher tendency to choose self-employment. Finally, liquidity constraints of the HOH have a different impact on different family members residing with the HOH. The HOH liquidity constraints have the biggest impact on the labor market decisions of the spouses and children.

Notes

1. Accessed on November 3, 2020. <https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=CN>
2. Accessed on November 3, 2020. <https://data.worldbank.org/indicator/FR.INR.LEND?locations=CN>

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Data References

Survey and Research Center for China Household Finance, China Household Finance Survey, <http://www.chfsdata.org/>.

References

- Attanasio, O., H. Low, and V. Sanchez-Marcos. 2008. "Explaining Changes in Female Labor Supply in a Life-Cycle Model." *American Economic Review* 98 (4): 1517–1552. doi:10.1257/aer.98.4.1517.
- Bottazzi, R. 2004. Labour market participation and mortgage-related borrowing constraints. Working Paper.
- Bredtmann, J., S. Otten, and C. Rulff. 2018. "Husband's Unemployment and Wife's Labor Supply: The Added Worker Effect across." *Ilr Review* 71 (5): 1201–1231. doi:10.1177/0019793917739617.
- Cardia, E., and S. Ng. 2003. "Intergenerational Time Transfers and Childcare." *Review of Economic Dynamics* 6 (2): 431–454. doi:10.1016/S1094-2025(03)00009-7.
- Cardona-Sosa, L., L. A. Florez, L. F. Morales, and B. de la Republica, Banco de la República 2018. "How Does the Household Labour Supply Respond to the Unemployment of the Household Head?" *Labour* 32 (4): 174–212. doi:10.1111/labr.12138.
- Chiappori, P. A., M. C. Dias, and C. Meghir. 2018. "The Marriage Market, Labor Supply, and Education Choice." *Journal of Political Economy* 126 (S1): S26–S72. doi:10.1086/698748.
- Deaton, A. 1992. *Understanding Consumption*. New York, NY: Oxford University Press.
- Del Boca, D., and A. Lusardi. 2003. "Credit Market Constraints and Labor Market Decisions." *Labour Economics* 10 (6): 681–703. doi:10.1016/S0927-5371(03)00048-4.
- Feder, G., L. J. Lau, J. Y. Lin, and X. Luo. 1990. "The Relationship between Credit and Productivity in Chinese Agriculture: A Microeconomic Model of Disequilibrium." *American Journal of Agricultural Economics* 72 (5): 1151–1157. doi:10.2307/1242524.

- Fortin, N. M. 1995. "Allocation Inflexibilities, Female Labor Supply, and Housing Assets Accumulation: are Women Working to Pay the Mortgage?" *Journal of Labor Economics* 13 (3): 524–557. doi:10.1086/298384.
- Giannetti, M. 2011. "Liquidity Constraints and Occupational Choice." *Finance Research Letters* 8 (1): 37–44. doi:10.1016/j.frl.2010.08.001.
- Hajivassiliou, V. A., and Y. M. Ioannides. 2007. "Unemployment and Liquidity Constraints." *Journal of Applied Econometrics* 22 (3): 479–510. doi:10.1002/jae.953.
- Hayashi, F. 1985. "The Effect of Liquidity Constraints on Consumption: A Cross-Sectional Analysis." *The Quarterly Journal of Economics* 100 (1): 183–206. doi:10.2307/1885741.
- Henley, A. 2004. "House Price Shocks, Windfall Gains and Hours of Work: British Evidence." *Oxford Bulletin of Economics and Statistics* 66 (4): 439–456. doi:10.1111/j.1468-0084.2004.00088.x.
- Lee, G. H., and J. Parasnis. 2014. "Discouraged Workers in Developed Countries and Added Workers in Developing Countries? unemployment Rate and Labour Force Participation." *Economic Modelling* 41: 90–98. doi:10.1016/j.econmod.2014.04.005.
- Ogawa, N., and J. F. Ermisch. 1996. "Family Structure, Home Time Demands, and the Employment Patterns of Japanese Married Women." *Journal of Labor Economics* 14 (4): 677–702. doi:10.1086/209827.
- Ortigueira, S., and N. Siassi. 2013. "How Important is Intra-Household Risk Sharing for Savings and Labor Supply?" *Journal of Monetary Economics* 60 (6): 650–666. doi:10.1016/j.jmoneco.2013.05.007.
- Reher, D. S. 1998. "Family Ties in Western Europe: persistent Contrasts." *Population and Development Review* 24 (2): 203–234. doi:10.2307/2807972.
- Rossi, M., and S. Trucchi. 2016. "Liquidity Constraints and Labor Supply." *European Economic Review* 87: 176–193. doi:10.1016/j.euroecorev.2016.05.001.
- Shore, S. H. 2010. "For Better, for Worse: Intrahousehold Risk-Sharing over the Business Cycle." *Review of Economics and Statistics* 92 (3): 536–548. doi:10.1162/REST_a_00009.
- Stephens, M. Jr, 2002. "Worker Displacement and the Added Worker Effect." *Journal of Labor Economics* 20: 504–537.
- van Huizen, T. 2014. "More Wealth, Shorter Hours? evidence from The Netherlands." *Economics Letters* 125 (2): 323–326. doi:10.1016/j.econlet.2014.09.032.
- Zeldes, S. P. 1989. "Consumption and Liquidity Constraints: An Empirical Investigation." *Journal of Political Economy* 97 (2): 305–346. doi:10.1086/261605.

Appendix

Definitions of variables used in this study

Table A1. Variable Definitions. This table lists variable definitions.

Variable	Definition
Liquidity Constraints of HOH	Dummy variable equal to 1, when the head of the household's (HOH) is not liquidity constrained in the previous wave of the survey but is liquidity constrained in the current wave of the survey. Liquidity constraint occurs when the HOH's permanent income is less than their current income. Permanent income is calculated following Rossi and Trucchi (2016) and Deaton (1992). Permanent income is $y^p = \frac{r}{1+r} \left[1 - \frac{1}{(1+r)^{T-t+1}} \right]^{-1} [H_t + A_t]$, where, y^p is permanent income, r is the interest rate, T is the lifetime horizon equal to 76, t is the age of the household, H_t is the present value of the expected future labor income, and A_t is wealth, which equals total assets minus liabilities.
Labor Participation	Dummy variable equal to 1, when the household member is unemployed in t_1 and employed in t_2 .
Self-employment	Dummy variable equal to 1, if the household member is not self-employed in t_1 and is self-employed in t_2 , or extends working hours in t_2 .
Age	Household member's age.
One Child	Dummy variable equal to 1, if the family has one child.
Two or More Children	Dummy variable equal to 1, if the family has two or more children.
Married	Dummy variable equal to 1, if the couple is married.
Number of Workers	The number of employed members in a household.
Female	Dummy variable equal to 1, if the household member is female.
Education in Years	Number of years of education of the household member.
Net Wealth	The net wealth of household, (Total Assets - Liabilities).
Debt	Total amount of household debt.
Rural	Dummy variable equal to 1, if the household live in an area that is classified as rural.
Mortgage	Dummy variable equal to 1, if the household have a mortgage.