Online Appendix - Not for Publication

A Additional Empirical Results

A.1 Data Description and Additional Results using CMDS

Since 2009, the National Health Commission of China has conducted the China Migrants Dynamic Survey (CMDS). This survey collects data on migrants aged 16 to 60 through a series of questionnaire-based interviews on a yearly basis. We focus on the wave of 2010, which covers 100 cities and 128,000 observations. Specifically, CMDS provides information on migrants' origin province, the destination city, the amount of remittances sent home, the number and employment status of family members moving together, and the total household income in the destination city. Moreover, CMDS provides the sample weight for each observation so that we can use these weights to calculate the national representative statistics about migrants' remittance behavior and household migration pattern, as we summarized in Table A.1.

To construct the share of household moving together, we first determine the employment status of each family member. We classify a migrant as employed if he or she is in a working status. Thus, we know the number of households (i.e., the number of observations, since each household chooses one representative to answer the questionnaire) and the number of employees within each household. In this way, we construct the share of households moving together as the ratio of the total number of households with more than one employee to the number of households with at least one employee.

One challenge for constructing the share of total remittance in total migrants' income is that the respondents are only required to report the amount of remittance sent by themselves and the household total income in the destination city. Therefore, we have no direct information on the remittance sent by other family members and the respondent's income. We solve this problem by calculating the average income per worker within each household. In detail, we first divide the total household income by the number of employments within the household and thus we obtain the inferred income for the respondent migrant; then we aggregate the remittance and inferred income for all respondents. Based on this treatment, we restrict our sample to all respondents, and define the share of remittance in total migrants' income as the ratio of total remittance to total income. Accordingly, we calculate migrants' probability of remitting as the ratio of the number of respondents sending positive remittances to the total number of respondents.

Table A.1: Summary Statistics on Migrants' Remittance Behavior and Household Migration Pattern

Description	Value
Probability of remitting	0.730
For remitter: share of remittance in income	0.193
For all migrants: share of remittance in income	0.142
Share of households with one adult worker	0.440
Share of households with two adult workers	0.495
Share of households with more than two adult workers	0.065

Notes: We define the probability of remitting as the ratio of the number of migrants sending positive remittances to the total number of migrants. The share of remittance in income is the ratio of total remittance to total migrants' income: in the second row, we restrict our sample to remitters; in the third row, the sample includes all migrants. The share of households with one adult worker is calculated by the ratio of the number of households with only one adult worker to the number of households with at least one adult worker. The share of households with two adult workers (with more than two adult workers) is calculated by the ratio of the number of households with two adult workers (with more than two adult workers) to the number of households with at least one worker. The household here only considers the household with migrants and is destination-city-based. We restrict our sample to migrants who are currently working when summarizing the household migration pattern. All these variables are calculated using CMDS data.

A.2 Additional Results using CHIP

In this section, we use the Chinese Household Income Project (CHIP) survey data to present additional results about migrants' remittance behavior. The CHIP dataset is collected through a series of questionnaire-based interviews conducted in rural and urban areas. We focus on the Rural-Urban Migrant module and use the data in 2007 and 2008 since these two waves contain information about migrants' households and the use of remittance. The module covers 5,000 rural-to-urban migrant individuals randomly sampled from 15 major urban destinations in China.[28] We focus on three questions: "income from being employed" to gather detailed data about migrants' wage income; "how much did you remit to your home village?" to determine the amount of migrant's remittance; "the uses of remittance" to infer the motives of sending remittance.

According to the data, the use of remittances can be classified mostly as household consumption. Table A.2 lists the main uses of remittances. For 52% of migrants who send remittances, supporting family members' daily expenses is the most important use. Expenditure on children's education and housing construction can also be regarded as consumption, with 12% and 4% of migrants reporting them as the most important use of the transfer, respectively.

We provide more evidence of factors affecting migrants' remittance behavior based on the CHIP data. One challenge in examining the effect of the stayers' income is that, in the survey,

[28]The list of cities is: Shanghai; Guangzhou, Dongguan and Shenzhen (Guangdong province); Nanjing and Wuxi (Jiangsu Province); Hangzhou and Ningbo (Zhejiang province) ; Wuhan (Hubei province); Hefei and Bengbu (Anhui province); Zhengzhou and Luoyang (Henan province); Chongqing; Chengdu (Sichuan province).

we do not know migrants' home regions, and migrants do not report the average income in their home region. The only available information is the self-estimated income of migrants had they stayed in their home villages. This variable contains information on the income level in the migrant's hometown as well as the earning power of the migrant. Table A.3 reports the results. The amount of remittances increases with migrants' income and decreases with the reported minimal living expenditure and the number of family members in the cities.

In CHIP, we do not have a good proxy for the income of the left-behind family members. In the regressions, we control for the reported income of the migrant if he/she did not migrate. We find a positive or zero effect of this variable on remittances. It is possible that this measure is a poor proxy for the demand for income of left-behind family members. For example, migrants who expect strong wage growth in the future may remit more, and such expectations may not be captured by their current income but can be correlated with their unobserved ability, which may be picked by their reported income if they did not migrate. We provide better evidence that family members' demand for income increases remittances in Section 2 using the CMDS data.

Table A.2: Use of Remittance

	First Choice (%)	All Choices (%)
Daily Expenses	52	34
Elderly Pension	25	31
Child Education Expenditure	12	14
Marriage Preparation	4	7
Housing	4	6
Others	2	7

Notes: Data source is the CHIP of 2007. Surveyed migrants are asked to choose the three most important uses of remittances and sort these uses from foremost to less important. Thus, each migrant has a first, second and third choice. The key variable here is the percentage of remitted migrants that send remittances for the corresponding usage. We summarized their first choice of uses in the first column, i.e., the foremost use of remittances. In the second column, we summarize all three choices.

Table A.3: Determinants of Remittances Using Alternative Dataset (CHIP 2007/2008)

	(1) log(remittance)	(2) log(1 + remittance)	(3)) $\mathbf{1}$(remittance >0)
log(Migrant's Income)	0.638^a	1.617^a	0.154^a
	(0.042)	(0.100)	(0.011)
log(Migrant's Minimal Living Expenditure)	-0.106^a	-0.379^a	-0.040^a
	(0.025)	(0.070)	(0.009)
No. of Family Members Moving Together	-0.247^a	-0.542^a	-0.051^a
	(0.023)	(0.057)	(0.007)
log(Income at Hometown If Not Migrate)	0.132^a	-0.023	-0.013
	(0.023)	(0.064)	(0.008)
Year FE	Yes	Yes	Yes
City FE	Yes	Yes	Yes
Observations	5748	9298	9302
R^2	0.167	0.082	0.063

Notes: Data source is the CHIP of 2007 and 2008 since only these two waves include information related to the estimated earnings of migrants if they still work in their hometown village. The dependent variables are the log of remittances measured in Chinese Yuan (or one plus remittance values) or an indicator of whether the migrant sends remittances back to his/her home village. Year and destination city fixed effects are controlled. Robust standard errors are in parentheses. Significance levels: c 0.1, b 0.05, a 0.01.

B Additional Theoretical Results

B.1 Aggregate Expenditure Share

By maximizing the problem in equation (1), we obtain the following individual ω's expenditure in goods j:

$$\alpha^j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} v_n(\omega)+\alpha_j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} \sum_{k\in\{A,M,S\}} P_n^k\bar{c}^k - P_n^j\bar{c}^j,$$

where $v_n(\omega)$ is the income for this individual, and the subscript n denotes the region where he works. Aggregating the expenditure in goods j from all workers in region n, we have the regional total expenditure in goods j:

$$\alpha^j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} E_n+\alpha_j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} \sum_{k\in\{A,M,S\}} P_n^k\bar{c}^k L_n - P_n^j\bar{c}^j L_n,$$

where $E_n = \sum_\omega v_n(\omega)$ is the total income of all workers in region n, and L_n is the total population in region n.

Then, the aggregate expenditure share of goods j in region n is:

$$S_n^j=\alpha^j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma}+\frac{\alpha^j\left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} \sum_{k\in\{A,M,S\}} P_n^k\bar{c}_n^k - P_n^j\bar{c}_n^j}{E_n}, \tag{B.1}$$

where $\bar{c}_n^j = \bar{c}^j L_n$. The aggregate expenditure share can also be represented by a representative agent with average income $\bar{v}_n$, that is:

$$S_n^j = \alpha^j \left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} + \frac{\alpha^j \left(\frac{P_n^j}{P_n}\right)^{1-\varsigma} \sum_{k\in\mathcal{J}} P_n^k \bar{c}^k - P_n^j \bar{c}^j}{\bar{v}_n}. \tag{B.2}$$

B.2 Proof of Proposition 1

Situation 1: Both stay at home or move together

In this situation, Member 1 and Member 2 either stay in their hometown or migrate together. Taking the log of equation (8), we rewrite the optimization problem as

$$\max_{T_1,T_2} \log U = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2), \; s.t., \; T_1 + T_2 \geq 0.$$

The Lagrangian in this case is

$$L(T_1, T_2, \rho) = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2) + \rho(T_1 + T_2),$$

and the Karush-Kuhn-Tucker (KKT) conditions are

$$\begin{aligned} \frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho &= 0, \\ \frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho &= 0, \\ \rho(T_1 + T_2) &= 0, \\ T_1 + T_2 &\geq 0, \\ \rho &\geq 0. \end{aligned}$$

We consider two cases:
Case 1. $\rho = 0$. In this case our system becomes

$$\begin{aligned} \frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} &= 0, \\ \frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} &= 0, \\ 0 &= 0, \\ T_1 + T_2 &\geq 0, \\ 0 &= 0. \end{aligned} \tag{B.4a}$$

Solving the first two equations together with the condition (B.4a), we have the optimal remittance

$$T_1^* = (1-\lambda_1)I_1 - \lambda_1 I_2 - \lambda_1 I_3$$
$$T_2^* = (1-\lambda_2)I_2 - \lambda_2 I_1 - \lambda_2 I_3,$$

when $I_1 + I_2 \geq (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3)$ holds.

Case 2. $T_1 + T_2 = 0$. In this case our system becomes

$$\begin{aligned} \frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho &= 0, \\ \frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho &= 0, \\ 0 &= 0, \\ T_1 + T_2 &= 0, \\ \rho &\geq 0. \end{aligned}$$

Solving the system we have

$$\begin{aligned} T_1^* &= \frac{\lambda_2 I_1 - \lambda_1 I_2}{\lambda_1 + \lambda_2} \\ T_2^* &= \frac{\lambda_1 I_2 - \lambda_2 I_1}{\lambda_1 + \lambda_2} \\ \rho &= \frac{(\lambda_1 + \lambda_2)I_3 - \lambda_3(I_1 + I_2)}{I_3(I_1 + I_2)}, \end{aligned}$$

and the optimal remittance (T_1^*, T_2^*) in this case exists when $\rho \geq 0$ holds, that is,

$$I_1 + I_2 \leq (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3).$$

To sum up, when Member 1 and 2 stay in the same place, Member 3 receives positive transfers from these two members if the share of Member 1 and 2's aggregate income in total household income is larger than the sum of these two members' utility weights. Otherwise, Member 2 and Member 1 only transfer to each other and thus no transfers send to Member 3.

Situation 2: One stays at home, and one moves out

In this scenario, Member 1 stays in his hometown while Member 2 migrates. The optimization problem is

$$\max_{T_1, T_2} \log U = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2), \ s.t., \ T_1 + T_2 \geq 0, \ T_2 \geq 0.$$

The Lagrangian in this scenario is

$$L(T_1, T_2, \rho_1, \rho_2) = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2) + \rho_1(T_1 + T_2) + \rho_2 T_2,$$

and the KKT conditions are

$$\begin{aligned}
\frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 &= 0, \\
\frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 + \rho_2 &= 0, \\
\rho_1(T_1 + T_2) &= 0, \\
T_1 + T_2 &\geq 0, \\
\rho_2 T_2 &= 0, \\
T_2 &\geq 0, \\
\rho_1 &\geq 0, \\
\rho_2 &\geq 0.
\end{aligned}$$

We consider four cases: **Case 1.** $\rho_1 = 0$ and $\rho_2 = 0$. In this case, the system becomes

$$\begin{aligned}
\frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} &= 0, \\
\frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} &= 0, \\
0 &= 0, \\
T_1 + T_2 &\geq 0, \\
0 &= 0, \\
T_2 &\geq 0, \\
\rho_1 &= 0, \\
\rho_2 &= 0.
\end{aligned}$$

Solve the system, we have the solution that

$$\begin{aligned}
T_1^* &= (1 - \lambda_1)I_1 - \lambda_1 I_2 - \lambda_1 I_3, \\
T_2^* &= (1 - \lambda_2)I_2 - \lambda_2 I_1 - \lambda_2 I_3,
\end{aligned}$$

when conditions $T_1 + T_2 \geq 0$ and $T_2 \geq 0$ hold, which means

$$I_1 + I_2 \geq (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3),$$

$$I_2 \geq \lambda_2(I_1 + I_2 + I_3).$$

That is, Member 2 sends remittance to the other two family members once the share of his income in the total household income is no less than his utility weight.

Case 2. $\rho_1 = 0$ and $T_2 = 0$. In this case, the system becomes

$$\begin{aligned}
\frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} &= 0,\\
\frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_2 &= 0,\\
0 &= 0,\\
T_1 + T_2 &\geq 0,\\
0 &= 0,\\
T_2 &= 0,\\
\rho_1 &= 0,\\
\rho_2 &\geq 0.
\end{aligned}$$

Solving this system, we have

$$\begin{aligned}
T_1^* &= \frac{\lambda_3 I_1 - \lambda_1 I_3}{\lambda_1 + \lambda_3}\\
T_2^* &= 0\\
\rho_2 &= \frac{\lambda_2}{I_2} - \frac{\lambda_1 + \lambda_3}{I_1 + I_3}
\end{aligned}$$

where $\rho_2 \geq 0$ implies that $I_2 \leq \lambda_2(I_1 + I_2 + I_3)$; and $T_1 + T_2 \geq 0$ implies that $I_1 \geq \frac{\lambda_1}{\lambda_1 + \lambda_3}(I_1 + I_3)$. In this case, Member 2 sends zero remittance because the share of his income in the total household income is no greater than his utility weight. Moreover, Member 1 transfers to Member 3 only if the share of his income in the total income of left-behind family members is greater than the share of his utility weight in the sum of left-behind members' weights.

Case 3. $T_1 + T_2 = 0$ and $\rho_2 = 0$. In this case, the system is

$$\begin{aligned}
\frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 &= 0,\\
\frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 &= 0,\\
0 &= 0,\\
T_1 + T_2 &= 0,\\
0 &= 0,
\end{aligned}$$

$$T_2 \geq 0,$$
$$\rho_1 \geq 0,$$
$$\rho_2 = 0.$$

Solving the system, we have

$$T_1^* = \frac{\lambda_2 I_1 - \lambda_1 I_2}{\lambda_1 + \lambda_2}$$
$$T_2^* = \frac{\lambda_1 I_2 - \lambda_2 I_1}{\lambda_1 + \lambda_2}$$
$$\rho_1 = \frac{(\lambda_1 + \lambda_2) I_3 - \lambda_3 (I_1 + I_2)}{I_3 (I_1 + I_2)}$$

where $\rho_1 \geq 0$ implies that $I_1 + I_2 \leq (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3)$; and $T_2 \geq 0$ implies that $I_2 \geq \frac{\lambda_2}{\lambda_1+\lambda_2}(I_1 + I_2)$. In this case, Member 3 receives zero transfer from other members while Member 1 receive the remittance from Member 2.

Case 4. $T_1 + T_2 = 0$ and $T_2 = 0$.

$$\frac{-\lambda_1}{I_1 - T_1} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 = 0,$$
$$\frac{-\lambda_2}{I_2 - T_2} + \frac{\lambda_3}{I_3 + T_1 + T_2} + \rho_1 + \rho_2 = 0,$$
$$0 = 0,$$
$$T_1 + T_2 = 0,$$
$$0 = 0,$$
$$T_2 = 0,$$
$$\rho_1 \geq 0,$$
$$\rho_2 \geq 0.$$

In this case, $T_1^* = 0$ and $T_2^* = 0$. Solving the system, we have

$$\rho_1 = \frac{\lambda_1}{I_1} - \frac{\lambda_3}{I_3}$$
$$\rho_2 = \frac{\lambda_2}{I_2} - \frac{\lambda_1}{I_2}$$

and the conditions $\rho_1 \geq 0$ and $\rho_2 \geq 0$ implies that if $I_1 \leq \frac{\lambda_1}{\lambda_1+\lambda_3}(I_1 + I_3)$ and $I_2 \leq \frac{\lambda_2}{\lambda_1+\lambda_2}(I_1 + I_2)$, no intra-household transfers within this family.

B.3 Proof of Corollary 1

In Situation 1 with Member 1 and Member 2 staying at the same place, the optimal remittances $\{T_1^*, T_2^*\}$ are continuous at the cut-off conditions, i.e., $I_1 + I_2 = (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3)$. Therefore, for Case 1, taking the derivative of $\{T_1^*, T_2^*\}$ with respect to $\{I_1, I_2, I_3, \lambda_1, \lambda_2, \lambda_3\}$, we have

$$\frac{\partial T_1^*}{\partial I_1} > 0, \quad \frac{\partial T_1^*}{\partial I_2} < 0, \quad \frac{\partial T_1^*}{\partial I_3} < 0, \quad \frac{\partial T_1^*}{\partial \lambda_1} < 0, \quad \frac{\partial T_1^*}{\partial \lambda_2} = 0, \quad \frac{\partial T_1^*}{\partial \lambda_3} = 0,$$
$$\frac{\partial T_2^*}{\partial I_1} < 0, \quad \frac{\partial T_2^*}{\partial I_2} > 0, \quad \frac{\partial T_2^*}{\partial I_3} < 0, \quad \frac{\partial T_2^*}{\partial \lambda_1} = 0, \quad \frac{\partial T_2^*}{\partial \lambda_2} < 0, \quad \frac{\partial T_1^*}{\partial \lambda_3} = 0.$$

Similarly, we have the following first-order conditions under Case 2:

$$\frac{\partial T_1^*}{\partial I_1} > 0, \quad \frac{\partial T_1^*}{\partial I_2} < 0, \quad \frac{\partial T_1^*}{\partial I_3} = 0, \quad \frac{\partial T_1^*}{\partial \lambda_1} < 0, \quad \frac{\partial T_1^*}{\partial \lambda_2} > 0, \quad \frac{\partial T_1^*}{\partial \lambda_3} = 0,$$
$$\frac{\partial T_2^*}{\partial I_1} < 0, \quad \frac{\partial T_2^*}{\partial I_2} > 0, \quad \frac{\partial T_2^*}{\partial I_3} = 0, \quad \frac{\partial T_2^*}{\partial \lambda_1} > 0, \quad \frac{\partial T_2^*}{\partial \lambda_2} < 0, \quad \frac{\partial T_2^*}{\partial \lambda_3} = 0.$$

In Situation 2, with only Member 2 migrating while Member 1 staying in his hometown, we can easily obtain that the optimal remittances $\{T_1^*, T_2^*\}$ are continuous at the cut-off conditions. Then, taking the derivative of $\{T_1^*, T_2^*\}$ with respect to $\{I_1, I_2, I_3, \lambda_1, \lambda_2\}$ under all cases, we can summarize the first-order conditions as

$$\frac{\partial T_1^*}{\partial I_1} \geq 0, \quad \frac{\partial T_1^*}{\partial I_2} \leq 0, \quad \frac{\partial T_1^*}{\partial I_3} \leq 0, \quad \frac{\partial T_1^*}{\partial \lambda_1} \leq 0, \quad \frac{\partial T_1^*}{\partial \lambda_2} \geq 0, \quad \frac{\partial T_1^*}{\partial \lambda_3} \geq 0,$$
$$\frac{\partial T_2^*}{\partial I_1} \leq 0, \quad \frac{\partial T_2^*}{\partial I_2} \geq 0, \quad \frac{\partial T_2^*}{\partial I_3} \leq 0, \quad \frac{\partial T_2^*}{\partial \lambda_1} \geq 0, \quad \frac{\partial T_2^*}{\partial \lambda_2} \leq 0, \quad \frac{\partial T_1^*}{\partial \lambda_3} \geq 0.$$

To sum up, given the property of first-order conditions under all possible situations, we can conclude that the optimal transfers $\{T_1^*, T_2^*\}$ are weakly increasing in the income of the focal family member and weakly decreasing in the income of the other members. Moreover, the optimal transfers weakly decreasing in the utility weight of the focal family member and are weakly increasing in the weights of other family members.

B.4 Optimal Transfer When Migrants' Remittances are Banned

Situation 1: Member 1 and Member 2 both stay at their hometown. In this situation, no migration happens within the household. The intra-household transfers across Member 1 and Member 2 to Member 3 are the same as the similar scenario in Appendix B.2. Therefore, if $I_1 + I_2 \geq (\lambda_1 + \lambda_2)(I_1 + I_2 + I_3)$,

$$T_1^* = (1 - \lambda_1)I_1 - \lambda_1 I_2 - \lambda_1 I_3; \quad T_2^* = (1 - \lambda_2)I_2 - \lambda_2 I_1 - \lambda_2 I_3;$$

else,

$$T_1^* = \frac{\lambda_2 I_1 - \lambda_1 I_2}{\lambda_1 + \lambda_2}; \quad T_2^* = \frac{\lambda_1 I_2 - \lambda_2 I_1}{\lambda_1 + \lambda_2}.$$

Situation 2: Member 1 and Member 2 move out together. In this situation, both members are migrants. Although transfers to Member 3 are banned, Members 1 and 2 can transfer money to each other. Therefore, the optimization problem changes to

$$\max_{T_1,T_2} \log U = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2), \ s.t., \ T_1 + T_2 = 0.$$

Solving this problem, we have

$$\begin{aligned} T_1^* &= \frac{\lambda_2 I_1 - \lambda_1 I_2}{\lambda_1 + \lambda_2} \\ T_2^* &= \frac{\lambda_1 I_2 - \lambda_2 I_1}{\lambda_1 + \lambda_2}. \end{aligned}$$

Situation 3: Member 2 moves out alone. In this situation, Member 1 stays in his hometown, while Member 2 move out alone. Although we ban the transfers from Member 2, Member 1 can transfer money to support Member 3. The optimization problem in this situation is

$$\max_{T_1,T_2} \log U = \lambda_1 \log(I_1 - T_1) + \lambda_2 \log(I_2 - T_2) + \lambda_3 \log(I_3 + T_1 + T_2), \ s.t., \ T_1 \geq 0, \ T_2 = 0.$$

Solving this problem, we have

$$\begin{aligned} T_1^* &= \frac{\lambda_3 I_1 - \lambda_1 I_3}{\lambda_1 + \lambda_3}, && \text{if } I_1 \geq \frac{\lambda_1}{\lambda_1 + \lambda_3}(I_1 + I_3); \\ T_1^* &= 0, && \text{if } I_1 < \frac{\lambda_1}{\lambda_1 + \lambda_3}(I_1 + I_3). \end{aligned}$$

B.5 Household Expected Utility

Given that the idiosyncratic household preference over workplaces and sectors, b_{ni}^{kj}, is drawn from a Fréchet distribution $F_{ni}^{kj}(b) = e^{-B_{ni}^{kj} b^{-\epsilon}}$, we first show that the indirect utility function for a household from region o with *Hukou* type $\mathcal{H} \in \{\mathcal{R}, \mathcal{U}\}$

$$U_{o,ni}^{\mathcal{H},kj} = \frac{b_{ni}^{kj} u_{o,ni}^{\mathcal{H},kj}}{\kappa_{ni} (\mu_{on}^{\mathcal{H},k})^{\lambda_1} (\mu_{oi}^{\mathcal{H},j})^{\lambda_2}}$$

also has a Fréchet distribution:

$$
\begin{aligned}
\Pr\left[U_{o,ni}^{\mathcal{H},kj} \le U\right] &= \Pr\left[\frac{b_{ni}^{kj} u_{o,ni}^{\mathcal{H},kj}}{\kappa_{ni}(\mu_{on}^{\mathcal{H},k})^{\lambda_1}(\mu_{oi}^{\mathcal{H},j})^{\lambda_2}} \le U\right] \\
&= \Pr\left[b_{ni}^{kj} \le \frac{U\kappa_{ni}(\mu_{on}^{\mathcal{H},k})^{\lambda_1}(\mu_{oi}^{\mathcal{H},j})^{\lambda_2}}{u_{o,ni}^{\mathcal{H},kj}}\right] \\
&= e^{-B_{ni}^{kj}\left(\frac{u_{o,ni}^{\mathcal{H},kj}}{\kappa_{ni}(\mu_{on}^{\mathcal{H},k})^{\lambda_1}(\mu_{oi}^{\mathcal{H},j})^{\lambda_2}}\right)^{\epsilon} U^{-\epsilon}}.
\end{aligned}
$$

Therefore, we have $F_{o,ni}^{\mathcal{H},kj}(U) = e^{-\psi_{o,ni}^{\mathcal{H},kj} U^{-\epsilon}}$, where $\psi_{o,ni}^{\mathcal{H},kj} = B_{ni}^{kj}\left(\frac{u_{o,ni}^{\mathcal{H},kj}}{\kappa_{ni}(\mu_{on}^{\mathcal{H},k})^{\lambda_1}(\mu_{oi}^{\mathcal{H},j})^{\lambda_2}}\right)^{\epsilon}$.

Accordingly, the expected utility for a household from region o with *Hukou* type $\mathcal{H} \in \{\mathcal{R},\mathcal{U}\}$ is

$$
\begin{aligned}
\bar{U}_{o,ni}^{\mathcal{H},kj} &= \sum_{k',j'\in\mathcal{J}} \sum_{n',i'\in\mathcal{N}} \int_0^{\infty} \Pr\left[U_{o,n'i'}^{\mathcal{H},k'j'} \le U\right] U \mathrm{d}F_{o,ni}^{\mathcal{H},kj}(U) \\
&= \Gamma\left(\frac{\epsilon-1}{\epsilon}\right)\left[\sum_{k',j'\in\mathcal{J}} \sum_{n',i'\in\mathcal{N}} B_{n'i'}^{k'j'}\left(\frac{u_{o,n'i'}^{\mathcal{H},k'j'}}{\kappa_{n'i'}(\mu_{on'}^{\mathcal{H},k'})^{\lambda_1}(\mu_{oi'}^{\mathcal{H},j'})^{\lambda_2}}\right)^{\epsilon}\right]^{\frac{1}{\epsilon}},
\end{aligned}
\tag{B.11}
$$

where $\Gamma(\cdot)$ is the Gamma function.

C Additional Quantitative Results

C.1 Calibration of Input Shares

The input-output parameters are constructed using China's 2010 Input-Output Table. One issue is that the physical capital is excluded from our model, and thus the input share should be the share of gross output net of physical capital. To solve this issue, we follow Tombe and Zhu (2019) to transform the production function to be net of physical capital. Specifically, if the production technologies are

$$
Y = \tilde{A} L^{\tilde{\beta}} H^{\tilde{\eta}} M^{\tilde{\gamma}} K^{\tilde{\alpha}},
$$

where L, H, M and K stand for labor, land, intermediate input and capital, respectively, and $\tilde{\beta}+\tilde{\eta}+\tilde{\gamma}+\tilde{\alpha}=1$. Then, the gross output net of physical capital can be written as

$$
Y = A L^{\beta} H^{\eta} M^{\gamma},
$$

where $\beta = \tilde{\beta}/(1-\tilde{\alpha})$, $\eta = \tilde{\eta}/(1-\tilde{\alpha})$, and $\gamma = \tilde{\gamma}/(1-\tilde{\alpha})$. Therefore, the value of $\{\beta,\eta,\gamma\}$ can be inferred from the value added share of gross output, $\tilde{\beta}+\tilde{\eta}+\tilde{\alpha}$, and labor's and land's share of value added, i.e., $\tilde{\beta}/(\tilde{\beta}+\tilde{\eta}+\tilde{\alpha})$, $\tilde{\eta}/(\tilde{\beta}+\tilde{\eta}+\tilde{\alpha})$ and $\tilde{\alpha}/(\tilde{\beta}+\tilde{\eta}+\tilde{\alpha})$.

We begin with $\tilde{\alpha}$. We follow the assumption in Tombe and Zhu (2019) that land returns are allocated to labor in the agricultural sector but to operating surpluses in the manufacturing and services sectors. Therefore, in our data, the non-labor's share of output in the agriculture sector is the capital's share, and we still have to net out the land's share for non-agricultural sectors. To do so, we assume land's share of value-added is 0.06 in non-agricultural sectors, the same value as in Tombe and Zhu (2019). Then, we have $\tilde{\alpha}^A = 0.03$, $\tilde{\alpha}^M = 0.12$ and $\tilde{\alpha}^S = 0.27$.

We next consider $\tilde{\beta}$ and $\tilde{\eta}$. In our data, the share of value-added in gross output is 0.58 in agriculture, 0.22 in manufacturing, and 0.55 in services. As mentioned, the input-output table allocates land returns to labor compensation in agriculture. The labor's share of value-added in China's agricultural sector is estimated to be 0.46 by Adamopoulos et al. (2017). Combining this value with our data, we have land's share of value-added equals 0.49.[29] Thus, together with our estimates for $\tilde{\alpha}$, we have $\beta^A = 0.46 \times 0.58/(1-0.03) \approx 0.28$ and $\eta^A = 0.49 \times 0.58/(1-0.03) \approx 0.29$. For manufacturing, we have $\beta^M = 0.39 \times 0.22/(1-0.12) \approx 0.10$ and $\eta^M = 0.06 \times 0.22/(1-0.12) \approx 0.02$; for the services sector, we have $\beta^S = 0.45 \times 0.55/(1-0.27) \approx 0.34$ and $\eta^S = 0.06 \times 0.55/(1-0.27) \approx 0.05$.

Finally, input-output shares are directly computed from our data. Intermediate input's shares of gross output are as in Table C.4. Dividing all $\tilde{\gamma}$ by the corresponding $1-\tilde{\alpha}$ and combining all the estimated results, we have the input-output matrix as in Table C.5.

Table C.4: Input Shares of Gross Output

$\tilde{\gamma}$	Output Industry		
Input	A	M	S
A	0.13	0.05	0.01
M	0.22	0.63	0.24
S	0.06	0.11	0.20

Table C.5: Input Shares of Gross Output Net of Physical Capital

	Output Industry		
Input	A	M	S
L	0.28	0.10	0.34
H	0.29	0.02	0.05
A	0.14	0.05	0.02
M	0.22	0.71	0.32
S	0.07	0.12	0.27

[29] We can compute capital's share of value-added from: $0.03/0.58 \approx 0.05$; thus, land's share of value added is $1-0.05-0.46 = 0.49$.

C.2 Normalization of Productivities

In this subsection, we show that the normalization of productivities in our model delivers an equivalent equilibrium as long as the conditions are satisfied. Here, we denote $\hat{x} = x'/x$ as the equilibrium relative change in variable x in response to some changes in model parameters.

Proposition C.1. *The normalization of productivities A_n^j delivers an equivalent equilibrium after the model is calibrated to the same set of moments if the values of $\alpha^{j\prime}$ and $\bar{c}^{j\prime}$ satisfy:*

$$\alpha^{j\prime} = \frac{\alpha^j(\hat{P}^j)^{\varsigma-1}}{\sum_j \alpha^j(\hat{P}^j)^{\varsigma-1}}, \quad \bar{c}^{j\prime} = \frac{\bar{c}^j}{\hat{P}^j}.$$

Proof. We prove this result using a guess-and-verify strategy. Suppose we rescale productivity A_n^j across all locations such that $\hat{A}_n^j = \hat{A}^j, \forall n$. To maintain the same factor prices($\hat{w}_n^j = 1,\ \hat{r}_n = 1$) and labor allocations($\hat{L}_n^j = 1$), the changes in the unit costs should satisfy $\hat{c}_n^j = \hat{c}^j$ (which means $\hat{\pi}_{ni}^j = 1$ and $\hat{P}_n^j = \hat{P}^j$) and the changes in consumers' expenditure share satisfy $\hat{S}_n^j = \hat{S}^j$.

We first prove that the changes in the unit costs are nation-wide, i.e., $\hat{c}_n^j = \hat{c}^j$. The relative changes of unit cost and price can be written as

$$\hat{c}_n^j = \prod_{k\in\mathcal{J}} (\hat{P}_n^k)^{\gamma^{jk}},$$
$$\hat{P}_n^j = (\hat{A}_n^j)^{\frac{1}{\theta}} \hat{c}_n^j.$$

Taking the log, we have

$$\log \hat{c}_n^j = \sum_k \gamma^{jk} \log \hat{P}_n^k = \sum_k \gamma^{jk}(-\frac{1}{\theta}\log \hat{A}_n^k + \log \hat{c}_n^k).$$

Expressing the changes of all sectors in a matrix form, we obtain

$$(I-\Omega)\log \hat{c}_n = -\frac{1}{\theta}\Omega \log \hat{A}_n,$$

where $\Omega = \left\{\gamma^{jk}\right\}_{j,k}$, $\log \hat{c}_n = \begin{bmatrix} \log \hat{c}_n^A \\ \log \hat{c}_n^M \\ \log \hat{c}_n^N \end{bmatrix}$, $\log \hat{A}_n = \begin{bmatrix} \log \hat{A}_n^A \\ \log \hat{A}_n^M \\ \log \hat{A}_n^N \end{bmatrix}$. Therefore,

$$\log \hat{c}_n = -\frac{1}{\theta}(I-\Omega)^{-1}\Omega \log \hat{A}_n.$$

Because $\hat{A}^j_n = \hat{A}^j$ is not location specific, we can rewrite the above equation as

$$\log \hat{c} = -\frac{1}{\theta}(I - \Omega)^{-1}\Omega \log \hat{A}.$$

Thus, we have $\hat{c}^j_n = \hat{c}^j$, which means the relative change in c^j_n is nation-wide. The relative change of prices

$$\log \hat{P}_n = -\frac{1}{\theta}(I - \Omega)^{-1} \log \hat{A},$$

where $\log \hat{P}_n = \begin{bmatrix} \log \hat{P}^A_n \\ \log \hat{P}^M_n \\ \log \hat{P}^N_n \end{bmatrix}$, is also nation-wide, i.e., $\hat{P}^j_n = \hat{P}^j$.

However, under the non-homothetic Stone-Geary preference, the changes of A^j_n might lead to $S^{j\prime}_n$ different from S^j_n. To maintain the consumption share, one solution is to rescale α^j according to $\hat{P}^j$ such that $\sum_j \alpha^{j\prime} = 1$, and rescale $\bar{c}^j$ such that $\widehat{\bar{c}^j}\hat{P}^j = 1$. That is:

$$\alpha^{j\prime} = \frac{\alpha^j(\hat{P}^j)^{\varsigma-1}}{\sum_j \alpha^j(\hat{P}^j)^{\varsigma-1}}, \quad \widehat{\bar{c}^j} = \frac{1}{\hat{P}^j}. \tag{C.12}$$

To sum up, the normalization of productivity, A^j_n, delivers an equivalent equilibrium after the model is calibrated to the same set of moments if equation (C.12) satisfies.

□

Although we know how to maintain consumption shares according to the normalization of productivities, we do not know the original values of A^j_n and thus cannot pin down $\bar{c}^{j\prime}$ and $\alpha^{j\prime}$. We overcome this challenge in two steps. First, we use the data on total expenditures, i.e. taking consumption shares as given, to calibrate productivities. Normalization in this way will not lead to a different equilibrium. Once we calibrated all A^j_n, we know the model-implied prices. Second, based on equation (3), we can estimate $\bar{c}^j$ and α^j to match the consumption shares in the data. The estimated results are namely $\alpha^{j\prime}$ and $\bar{c}^{j\prime}$, which maintain the consumption when we rescale A^j_n.

C.3 Details on Mechanism Decomposition

We discuss the details of mechanism decomposition in this subsection. Given that the Stone-Geary preference (SG) captures all mechanisms, we can decompose the role of the first three mechanisms, i.e., unequal demand change, price effect and income effect, by changing the preference from SG to constant elasticity of substitution (CES) and Cobb-Douglas (CD) preference. Figure C.1 provides a graphical illustration of this decomposition.

In detail, we isolate the income effect by comparing the results of banning remittances under SG preference to those under CES preference. To do so, we adopt the CES preference and recalibrate the model to conduct the same counterfactual of banning remittances. The difference between the results of banning remittances in our baseline model ($\triangle SG$) and the results under CES ($\triangle CES$) reveals the income effect. Then, similar to the steps in isolating the income effect, we compare the results under CES preference ($\triangle CES$) to those under CD preference ($\triangle CD$) to obtain the price effect.

However, banning remittances will also change migrants' willingness to migrate and thus change the model's prediction on structural change. These effects will contaminate the size of the unequal demand change effect if we simply compare the results under CD preference when banning remittances (CD^1) to those under CD preference with remittances (CD^0). To accurately isolate the size of the unequal demand change mechanism, we first recalibrate a model with remittances under CD preferences (CD^0). Next, we solve a "fixed-migration no-remittance equilibrium" denoted by ($\overline{CD^1}$) by fixing the household migration pattern at the initial equilibrium level under CD preference (CD^0), banning remittances and then allowing workers to change their industries. Therefore, the difference between the "fixed-migration no-remittance equilibrium" $\overline{CD^1}$ and the equilibrium with remittance under CD preference CD^0 measures the magnitude of unequal demand change effect. Correspondingly, we can identify the migration effect by comparing the equilibrium under CD preference banning remittance (CD^1) to the "fixed-migration no-remittance equilibrium" ($\overline{CD^1}$).

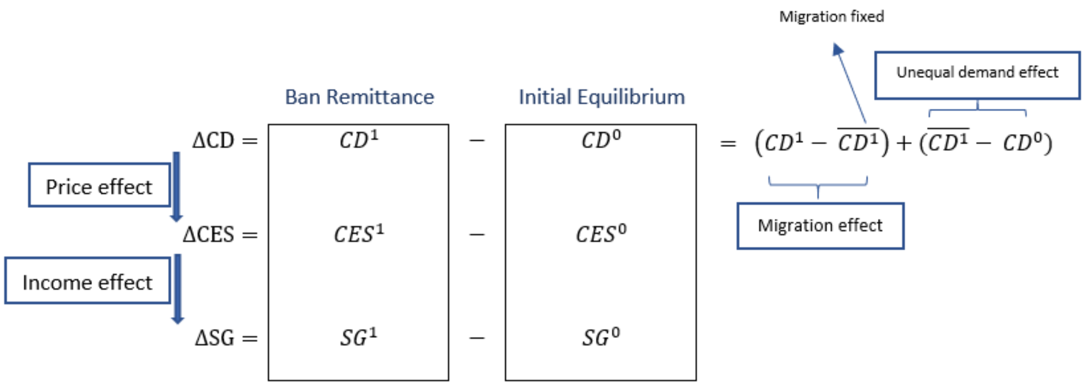
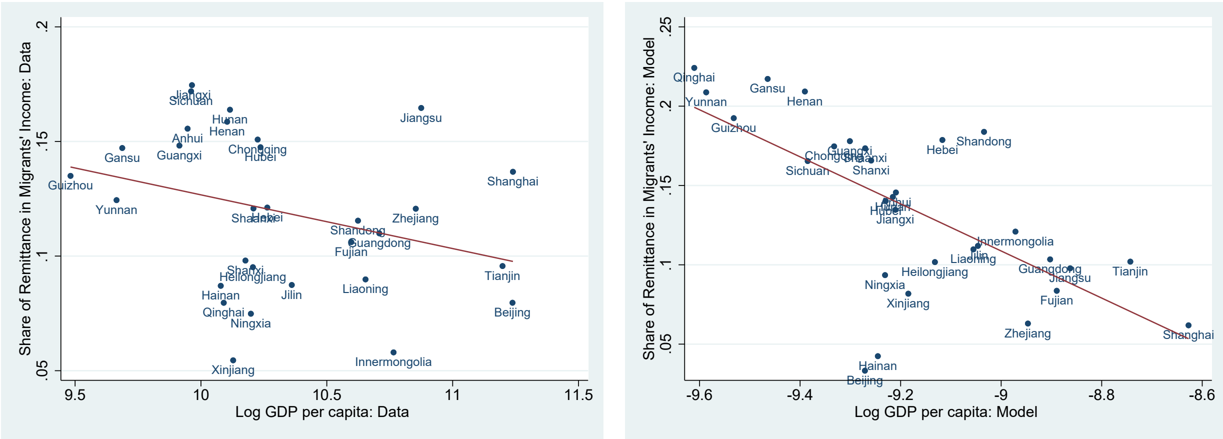


Figure C.1: Mechanism Decomposition

Notes: CD^1, CES^1 and SG^1 denote the equilibrium when banning remittances under CD, CES and SG preferences, respectively; CD^0, CES^0 and SG^0 denote the initial equilibrium with remittances under CD, CES and SG preferences, respectively; $\triangle CD$ measures the change from CD^1 to CD^0, and the meanings of $\triangle CES$ and $\triangle SG$ are similar. $\overline{CD^1}$ is the "fixed-migration no-remittance equilibrium" under CD preference. We solve this equilibrium by fixing the household migration pattern at the initial equilibrium level under CD preference (CD^0), banning remittances and then allowing workers to change their industries.

C.4 Additional Results

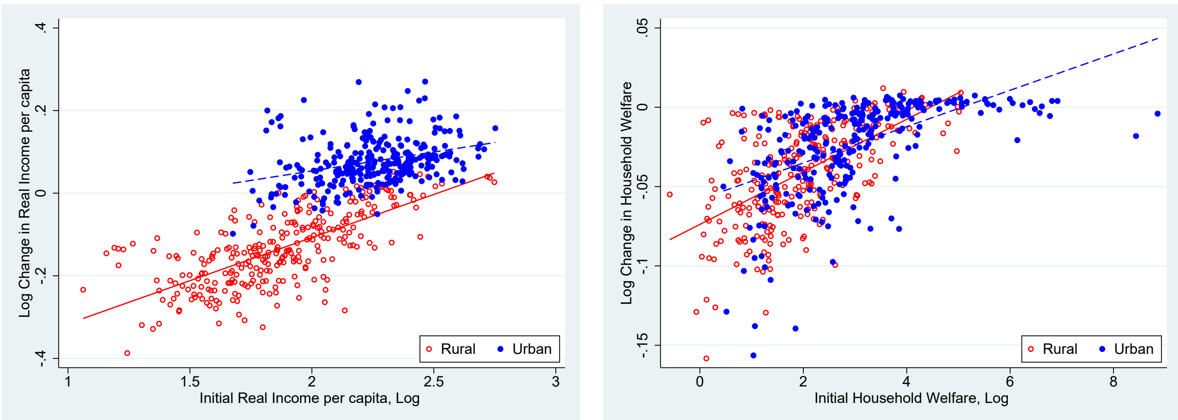


(a) Data

(b) Model

Figure C.2: Share of Remittance in Migrants' Income and GDP per capita, by Origin Province

Notes: These two figures plot the share of remittance in migrants' income against the GDP per capita (log) in the data and in the model, respectively. We calculate the shares based on the home province of the migrant. Each dot represents a province. The solid line through the dots is the linear fitted line. The slopes (with robust standard error) of the fitted lines are -0.023 (0.012) for Panel (a) and -0.148 (0.020) for Panel (b), respectively.

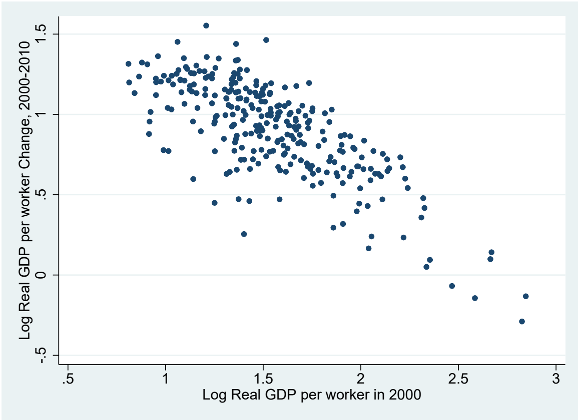


(a) Real Income

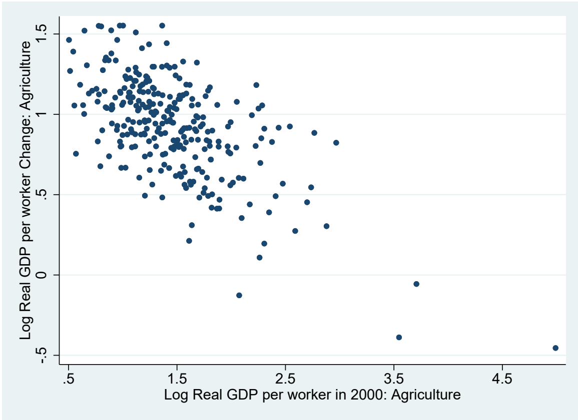
(b) Household Welfare

Figure C.3: Change in Log Real Income or Household Welfare after Banning Remittances

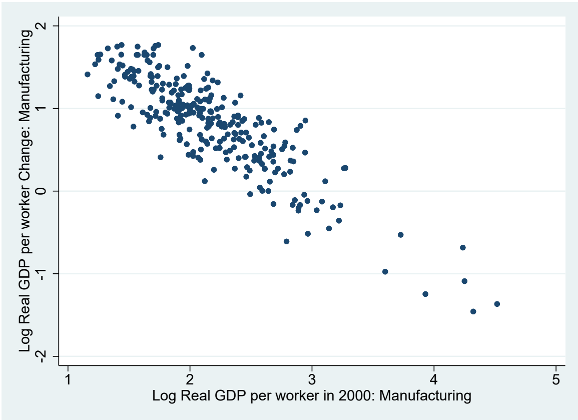
Notes: These two figures plot the change in log real income per capita (Panel (a)) or household welfare (Panel (b)) when banning remittance against their initial values in the benchmark with remittances. The hollow circles are for rural residents or households, while the solid circles are for urban residents or households. The slopes for the fitted lines (with robust standard error) in Panel (a) are: 0.21 (0.01) for rural; 0.09 (0.02) for urban. For Panel (b), the slopes for each linear fits (with robust standard error) in Panel (b) are: 0.02 (0.00) for rural; 0.01 (0.00) for urban. The positive slopes show an enlarging regional inequality. Meanwhile, the slope for rural is steeper either in terms of real income per capita or household welfare, indicating that rural residents or households suffer more from banning remittances.



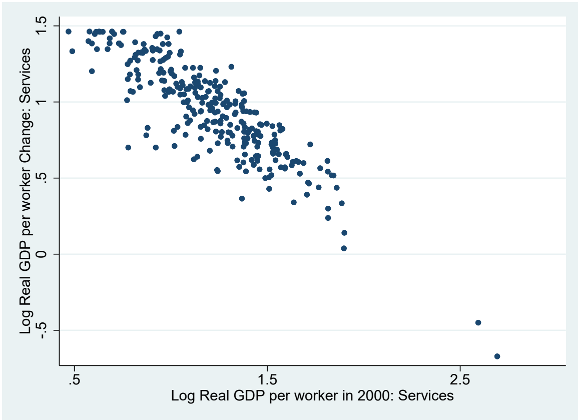
(a) Total



(b) Agriculture



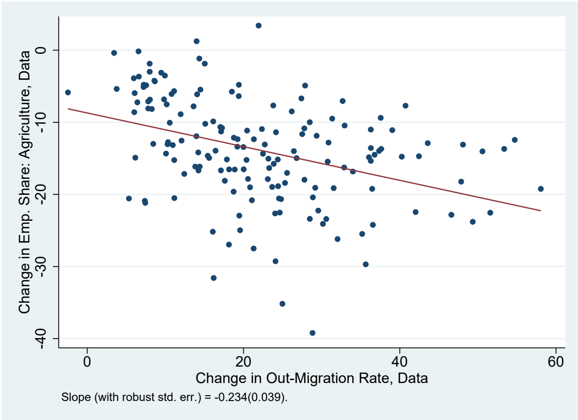
(c) Manufacturing



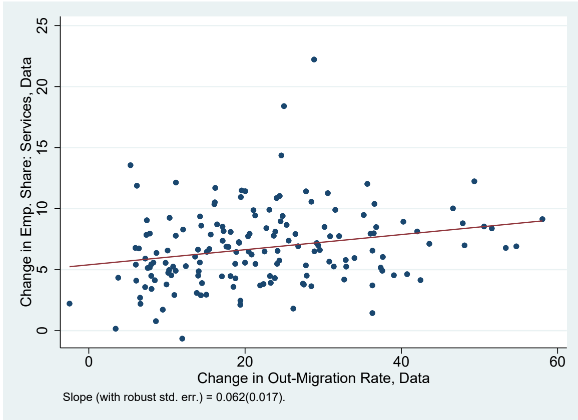
(d) Services

Figure C.4: Observed Change in Log Real GDP per worker, 2000 - 2010

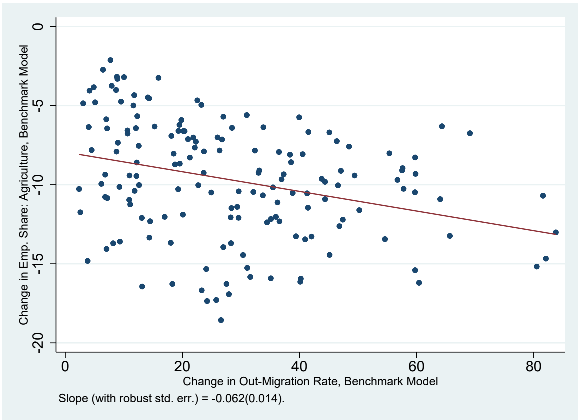
Notes: These figures display the change in log real GDP per worker in total, agriculture, manufacturing and services from 2000 to 2010 against the corresponding initial log real GDP per worker in 2000. Each dot represents a city in China. The negative relationship in these figures implies a convergence across cities.



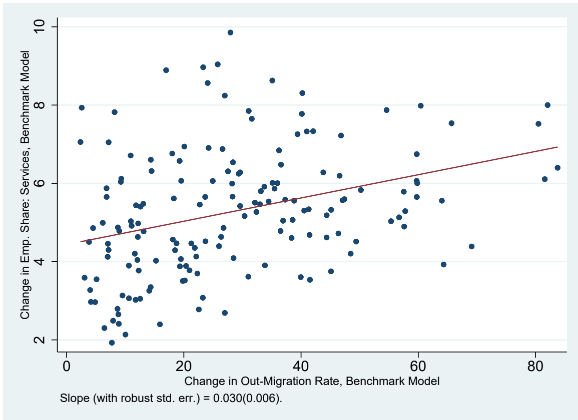
(a) Agriculture, Data



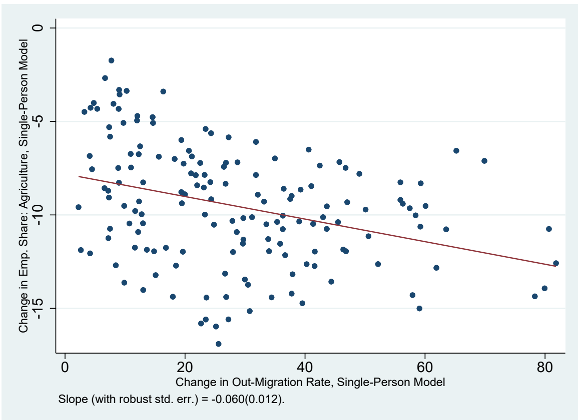
(b) Services, Data



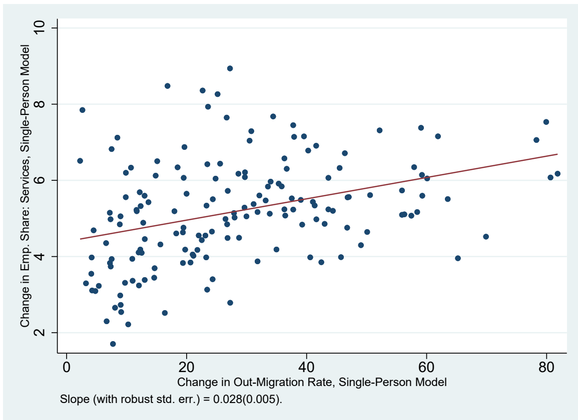
(c) Agriculture, Benchmark Model



(d) Services, Benchmark Model



(e) Agriculture, Single-Person Model



(f) Services, Single-Person Model

Figure C.5: Out Migration and Structural Change

Notes: These figures display the change in agriculture and services employment shares against the change in the out-migration rate under different settings. Panels (a) and (b) show the corresponding changes in the data from 2000 to 2010. Panels (c) and (d) report the counterfactual changes, i.e., change the migration costs from the levels in 2000 to 2010, in our benchmark household model with remittance; Panels (c) and (d) plot the counterparts in the single-person model without remittance motives. We restrict the sample to cities with net population outflows in 2000. For each city, the out-migration rate is defined as the ratio of the number of outflow migrants to the total population. The slope (with robust standard error) of each fitted line is reported in the figure.

D Sensitivity Analysis

D.1 Price Independent Generalized Linearity (PIGL) Preference

An alternative choice for non-homothetic preference is the Price Independent Generalized Linearity (PIGL) specification. Here we follow the preference structure specified in Boppart (2014) that allows agricultural goods to be necessities, services to be luxuries and manufacturing to be neutrals. The indirect utility function for an individual working in region n with earnings e is

$$u(e, \mathbf{P_n}) = \frac{1}{\rho}\left[\frac{e}{((P_n^A)^{\phi}(P_n^S)^{1-\phi})^{\alpha}\,(P_n^M)^{1-\alpha}}\right]^{\rho} - \frac{\eta}{\chi}\left[\frac{P_n^A}{P_n^S}\right]^{\chi}, \tag{D.13}$$

where $0 \leq \chi < 1$ governs the sensitivity of expenditure shares to changes in relative prices; $0 \leq \rho < 1$ governs the non-homotheticity between services and agriculture; $\eta > 0$ governs the importance of relative prices. Cobb-Douglas preference is a special case for PIGL when $\eta = 0$ and $\rho = 1$.

By using Roy's identity and aggregating the total demand of region n, we obtain the consumer expenditure shares in region n:

$$\begin{aligned}
S_n^A &= \alpha\phi + \eta\left[\frac{P_n^A}{P_n^S}\right]^{\chi}\left[\frac{\bar{e}_n}{((P_n^A)^{\phi}(P_n^S)^{1-\phi})^{\alpha}\,(P_n^M)^{1-\alpha}}\right]^{-\rho} \\
S_n^M &= 1-\alpha \\
S_n^S &= \alpha(1-\phi) - \eta\left[\frac{P_n^A}{P_n^S}\right]^{\chi}\left[\frac{\bar{e}_n}{((P_n^A)^{\phi}(P_n^S)^{1-\phi})^{\alpha}\,(P_n^M)^{1-\alpha}}\right]^{-\rho},
\end{aligned} \tag{D.14}$$

where $\bar{e}_n = \left[\sum_{\omega} \frac{e_n(\omega)^{1-\rho} L_n(\omega)}{E_n}\right]^{-\frac{1}{\rho}}$ is the weighted average income and E_n is the total income of region n. The expenditure shares imply that: as income grows, the share allocated to agricultural goods decreases and converges to $\alpha\phi$; the share allocated to services goods increases and converges to $\alpha(1-\phi)$; the expenditure share on manufacturing goods is fixed.

Optimal Remittances To obtain the closed-form expression of optimal remittances, we assume the household indirect utility function (not taking into account idiosyncratic preference shocks and migration costs) as the weighted sum of each member's indirect utility. Thus, conditional on the location and sector choices of Member 1 and Member 2, these two members simultaneously decide their amount of intra-household transfers to solve the optimization problem

$$\max_{T_1,T_2} \lambda_1 u(I_1 - T_1, \mathbf{P_1}) + \lambda_2 u(I_2 - T_2, \mathbf{P_2}) + \lambda_3 u(I_3 + T_1 + T_2, \mathbf{P_3}),$$

subject to $T_1 + T_2 \geq 0$ if Member 1 and 2 stay in the same place; $T_1 + T_2 \geq 0$ and $T_2 \geq 0$ if Member 2 migrates alone. Note that the subscript here denotes the type of family members; I_1, I_2 and I_3 are the pre-transfer income of each member, and T_1 and T_2 are the amount of transfers sent from Members 1 and Member 2. Solving this problem under different household migration scenarios, we obtain the following characterization of optimal remittances:

Proposition D.2. *Conditional on the location and sector choices of Member 1 and Member 2, the optimal transfers under different household migration situations are as follows:*

1. *When Member 1 and Member 2 stay in the same place.*

   (a) *If* $I_1 + I_2 \geq (\tilde{\lambda}_1 + \tilde{\lambda}_2)(I_1 + I_2 + I_3)$*,*

   $$T_1^* = (1 - \tilde{\lambda}_1)I_1 - \tilde{\lambda}_1 I_2 - \tilde{\lambda}_1 I_3; \quad T_2^* = (1 - \tilde{\lambda}_2)I_2 - \tilde{\lambda}_2 I_1 - \tilde{\lambda}_2 I_3;$$

   (b) *Else,*

   $$T_1^* = \frac{\tilde{\lambda}_2 I_1 - \tilde{\lambda}_1 I_2}{\tilde{\lambda}_1 + \tilde{\lambda}_2}; \quad T_2^* = \frac{\tilde{\lambda}_1 I_2 - \tilde{\lambda}_2 I_1}{\tilde{\lambda}_1 + \tilde{\lambda}_2}$$

2. *When Member 2 migrates alone*

   (a) *If* $I_1 + I_2 \geq (\tilde{\lambda}_1 + \tilde{\lambda}_2)(I_1 + I_2 + I_3))$ *and* $I_2 \geq \tilde{\lambda}_2(I_1 + I_2 + I_3)$*,*

   $$T_1^* = (1 - \tilde{\lambda}_1)I_1 - \tilde{\lambda}_1 I_2 - \tilde{\lambda}_1 I_3; \quad T_2^* = (1 - \tilde{\lambda}_2)I_2 - \tilde{\lambda}_2 I_1 - \tilde{\lambda}_2 I_3;$$

   (b) *If* $I_2 \leq \tilde{\lambda}_2(I_1 + I_2 + I_3)$*, while* $I_1 \geq \frac{\tilde{\lambda}_1}{\tilde{\lambda}_1 + \tilde{\lambda}_3}(I_1 + I_3)$*,*

   $$T_1^* = \frac{\tilde{\lambda}_3 I_1 - \tilde{\lambda}_1 I_3}{\tilde{\lambda}_1 + \tilde{\lambda}_3}; \quad T_2^* = 0$$

   (c) *If* $I_1 + I_2 \leq (\tilde{\lambda}_1 + \tilde{\lambda}_2)(I_1 + I_2 + I_3)$*, and* $I_2 \geq \frac{\tilde{\lambda}_2}{\tilde{\lambda}_1 + \tilde{\lambda}_2}(I_1 + I_2)$*,*

   $$T_1^* = \frac{\tilde{\lambda}_2 I_1 - \tilde{\lambda}_1 I_2}{\tilde{\lambda}_1 + \tilde{\lambda}_2}; \quad T_2^* = \frac{\tilde{\lambda}_1 I_2 - \tilde{\lambda}_2 I_1}{\tilde{\lambda}_1 + \tilde{\lambda}_2}$$

   (d) *If* $I_1 \leq \frac{\tilde{\lambda}_1}{\tilde{\lambda}_1 + \tilde{\lambda}_3}(I_1 + I_3)$ *and* $I_2 \leq \frac{\tilde{\lambda}_2}{\tilde{\lambda}_1 + \tilde{\lambda}_2}(I_1 + I_2)$

   $$T_1^* = 0; \quad T_2^* = 0.$$

Note that $\tilde{\lambda}_1, \tilde{\lambda}_2, \tilde{\lambda}_3$ here are the adjusted utility weights for Member 1, Member 2 and Member

3, respectively. Let i denotes the type of family members, then for $i \in \{1, 2, 3\}$,

$$\tilde{\lambda}_i = \frac{\lambda_i \left(\frac{\lambda_i}{P_i}\right)^{\frac{\rho}{1-\rho}}}{\sum_{k=1}^{3} \lambda_k \left(\frac{\lambda_k}{P_k}\right)^{\frac{\rho}{1-\rho}}}.$$

Therefore, given the adjusted utility weights of family members, the pattern of optimal intra-household transfers here is the same as that in the baseline model with Stone-Geary preference. The proof of Proposition D.2 is similar to that of Proposition 1 in Online Appendix B.2, and we skip the detailed proof here.

Calibration The calibration procedure is the same as that of the baseline model in our main text, except for the calibration of PIGL preference parameters. Specifically, following Boppart (2014), we set the strength of the income effect ρ and the price effect χ in the consumer expenditure shares to 0.22 and 0.41, respectively. We set η to 0.41, and thus the term $\frac{\eta}{\chi}$ in the indirect utility function (see equation (D.13)) equals to 1, same as in Eckert and Peters (2022). The long-run asymptotic expenditure share on agriculture goods ϕ is set to 0, which is in line with Hao et al. (2020) and close to the value 0.01 in Eckert and Peters (2022). Finally, according to nationwide expenditure shares sourced from the China Statistical Yearbooks, we set the share of services goods consumption in total non-agriculture consumption α as 0.64. With this PIGL preference, the calibrated utility weights of three household members are 0.41, 0.41 and 0.18, respectively. The iceberg separation cost equals 10.70. All these values are quantitatively similar to those in our baseline model.

We then repeat the main counterfactual experiment of banning migrants' remittances. In this case, migrants cannot send remittances to support family members left behind. Given this restriction, the optimal transfer between household members will change once one or two of them become migrants. In detail, in the scenario with Member 2 migrating and Member 1 staying in the hometown, the transfer from Member 2 is 0, i.e., $T_2^* = 0$, and the optimal transfers between Member 1 and Member 3 change to:[30]

$$\begin{aligned} T_1^* &= \frac{\tilde{\lambda}_3 I_1 - \tilde{\lambda}_1 I_3}{\tilde{\lambda}_1 + \tilde{\lambda}_3}, && \text{if } I_1 \geq \frac{\tilde{\lambda}_1}{\tilde{\lambda}_1 + \tilde{\lambda}_3}(I_1 + I_3); \\ T_1^* &= 0, && \text{if } I_1 < \frac{\tilde{\lambda}_1}{\tilde{\lambda}_1 + \tilde{\lambda}_3}(I_1 + I_3). \end{aligned}$$

When Member 1 and Member 2 migrate together, even though they cannot send remittance back, transfers between these two members are allowed. Thus, the optimal transfers under this

[30]The proof of optimal transfers here is similar to the proof in the baseline model with Stone-Geary preference, as in Online Appendix B.4.

scenario change to

$$T_1^* = \frac{\tilde{\lambda}_2 I_1 - \tilde{\lambda}_1 I_2}{\tilde{\lambda}_1 + \tilde{\lambda}_2}, \quad T_2^* = \frac{\tilde{\lambda}_1 I_2 - \tilde{\lambda}_2 I_1}{\tilde{\lambda}_1 + \tilde{\lambda}_2}.$$

Table D.6 reports the impacts of banning remittances on structural change. Overall, banning remittances increases the employment share in agriculture while decreases the employment shares in manufacturing and services. This reallocation effect is even stronger in the receiver region. Table D.7 reports the impacts of banning remittances on welfare and inequality. Same as in the baseline case, we find that banning remittances induces a decline in real income per capita for the whole economy and enlarges regional inequality. Hence, our main findings are qualitatively robust to the alternative PIGL preference.

Note that unlike the weighted geometric average in the benchmark model with Stone-Geary preference, we express the indirect household utility here as the weighted sum of each member's utility. In this case, for example, the marginal household utility from Member 2's one extra dollar consumption is independent of the other two members' consumption levels. Even though banning remittance interrupts the optimal income reallocation within the household, the migrant member can easily offset this loss through a higher-paid job. Therefore, compared to the benchmark analysis, the impact of banning remittance under PIGL preference is smaller.

Table D.6: The Impact of Banning Remittances on Sectoral Employment Shares: PIGL Preference

	Baseline: With Remittances	Counterfactual: Banning Remittances	Change
A. Overall			
Agriculture	42.1	42.3	0.2
Manufacturing	27.3	27.2	-0.0
Services	30.6	30.4	-0.1
B. Receiver Region			
Agriculture	58.4	58.7	0.3
Manufacturing	18.4	18.4	-0.0
Services	23.2	22.9	-0.3
C. Remitter Region			
Agriculture	23.2	23.2	0.1
Manufacturing	37.6	37.5	-0.0
Services	39.2	39.2	-0.0

Notes: This table reports the impacts of banning remittances on sectoral employment shares under PIGL preference. Columns 2 and 3 report the employment share (%) in the benchmark with remittances and in the counterfactual banning remittances, respectively. Column 4 is the corresponding percentage point change. The change of three sectors may not sum to 0 due to rounding.

Table D.7: The Impacts of Banning Remittance on Welfare and Inequality: PIGL Preference

	(1) All Cities	(2) Receiver Cities	(3) Remitter Cities
Panel A: Population-weighted Aggregate Variables			
$\triangle$% Price	-0.04	-0.6	0.7
$\triangle$% Nominal Income	-0.3	-4.2	3.4
$\triangle$% Real Income	-0.2	-3.6	2.7
$\triangle$% Household Welfare	0.0	-0.4	0.1
Panel B: Income/Welfare Inequality			
Var(Log Real Income) : Benchmark	0.24	0.24	0.19
Var(Log Real Income) : Ban Remittance	0.44	0.46	0.33
$\triangle$% Var(Log Real Income)	80.1	89.4	74.2
Var(Log Household Welfare): Benchmark	2.46	1.28	2.38
Var(Log Household Welfare): Ban Remittance	2.48	1.29	2.39
$\triangle$% Var(Log Household Welfare)	0.5	0.7	0.4

Notes: This table reports the impacts of banning remittances on welfare and inequality under PIGL preference. Panel A reports the impacts of banning remittance on the population-weighted aggregate variables. Panel B reports the inequality measured by the variance of log real income per capita and household welfare under the benchmark and the counterfactual of banning remittances, and the change in inequality induced by banning remittances. $\triangle$% denotes the percentage change.

D.2 Robustness to Alternative Trade Costs

Our calibration strategy of trade costs is similar to Fan (2019) but we find smaller trade costs. This could be because we use a different year as the baseline. It can also be caused by other differences in our model. We now borrow the coefficients of trade costs estimation from Fan (2019) to show that our main findings are robust to alternative trade costs setting. Table D.8 presents the detailed value of each parameter in Fan (2019). We generate the trade costs based on these parameters and then take these costs as given to recalibrate the remaining part following the same procedure described in Section 4.2.3.

Table D.9 reports the impacts of banning remittances on structural change. As we can see, banning remittance drives employment from manufacturing and services to the agriculture sector, and this pattern is more significant for the receiver region. This reallocation pattern is similar to our baseline case. Table D.10 reports the impacts of banning remittances on welfare and inequality. Consistent with the findings in the main text, the whole economy suffers from banning remittances, especially for receiver cities. Moreover, banning remittances exacerbates regional inequality, increasing the variance of log real income and log household welfare. The main takeaways from our benchmark analysis are robust to alternative trade cost setting.

Table D.8: Trade Costs Parameters from Fan (2019)

	Trade Costs
Panel A: Domestic trade costs parameters	
I_1(Different cities, same province)	0.57
I_2(Different provinces, same region)	1.21
I_3(Different regions)	1.51
I_4(Common provincial border)	-0.06
$I_1 \times Dist$	0.01
$I_2 \times Dist$	0.21
$I_3 \times Dist$	0.04
Panel B. International trade costs parameters	
Agriculture	0.99
Manufacturing	0.80

Notes: Panel A reports the parameters of domestic trade costs. $Dist$ is the distance between two cities. Panel B reports the international trade costs parameters for agriculture and manufacturing.

Table D.9: The Impact of Banning Remittances on Sectoral Employment Shares: Alternative Trade Cost Setting

	Baseline: With Remittances	Counterfactual: Banning Remittances	Change
A. Overall			
Agriculture	42.1	42.8	0.7
Manufacturing	27.3	27.0	-0.3
Services	30.6	30.2	-0.4
B. Receiver Region			
Agriculture	59.0	60.0	1.1
Manufacturing	18.0	17.6	-0.4
Services	23.1	22.4	-0.7
C. Remitter Region			
Agriculture	24.1	24.4	0.3
Manufacturing	37.2	37.0	-0.2
Services	38.7	38.6	-0.0

Notes: This table reports the impacts of banning remittances on sectoral employment shares under alternative trade costs. Columns 2 and 3 report the employment share (%) in the benchmark with remittances and in the counterfactual banning remittances, respectively. Column 4 is the corresponding percentage point change. The change of three sectors may not sum to 0 due to rounding.

Table D.10: The Impacts of Banning Remittances on Welfare and Inequality: Alternative Trade Cost Setting

	(1) All Cities	(2) Receiver Cities	(3) Remitter Cities
Panel A: Population-weighted Aggregate Variables			
△% Price	-0.05	-0.2	0.1
△% Nominal Income	-0.9	-4.5	2.8
△% Real Income	-0.9	-4.3	2.7
△% Household Welfare	-0.3	-3.1	0.0
Panel B: Income/Welfare Inequality			
Var(Log Real Income) : Benchmark	0.13	0.13	0.10
Var(Log Real Income) : Ban Remittance	0.24	0.26	0.18
△% Var(Log Real Income)	88.4	100.3	75.3
Var(Log Household Welfare): Benchmark	1.92	0.86	1.98
Var(Log Household Welfare): Ban Remittance	1.97	0.89	2.02
△% Var(Log Household Welfare)	2.5	3.6	1.7

Notes: This table reports the impacts of banning remittances on welfare and inequality under alternative trade cost setting. Panel A reports the impacts of banning remittance on the population-weighted aggregate variables. Panel B reports the inequality measured by the variance of log real income per capita and household welfare under the benchmark and the counterfactual of banning remittances, and the change in inequality induced by banning remittance. △% denotes the percentage change.