2006 Complex Systems Summer School Lectures, Beijing

Rural-urban Migration in China: Social Networks and Socio-demography

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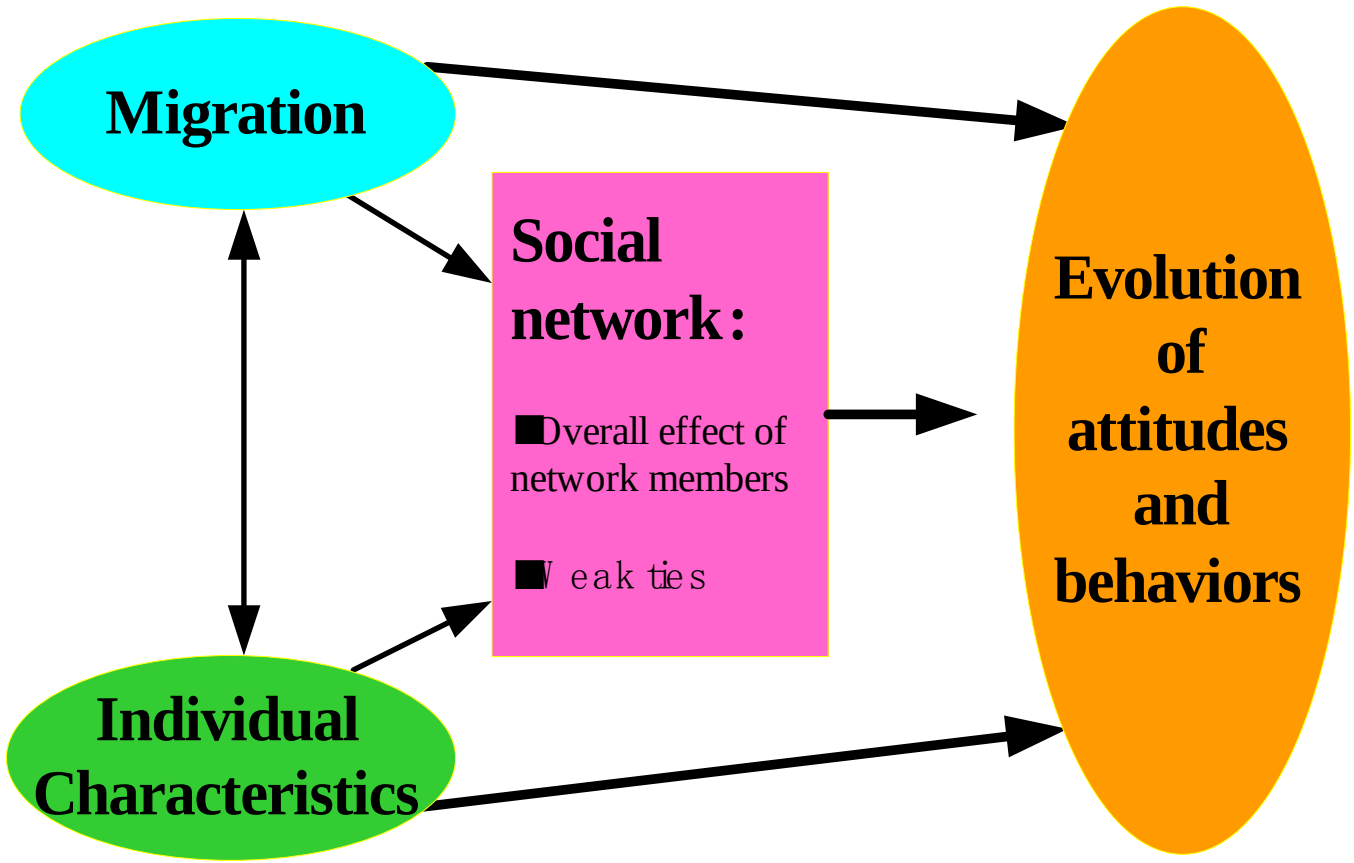
1. Statistical analysis

1.1 Effects of social network on son preference

Analysis Framework



Models

Dependent variables	**1. Attitude towards son preference (Cumulative logistic models):** ***What will you do when your first child is a girl?*** • *"Stop childbearing"-Without son preference (Ref.)* • *"Have a second child and stop"- Weak son preference* • *"Have more children until have a boy"- Strong son preference* **2. Behavior of son preference (Binary logistic models):** ***The gender of second birth after migration:*** • *Give birth to a girl (Ref.)* • *Give birth to a boy*
Independent variable	**Social network factors*** • *Overall effect of childbearing discussion network members* • *Weak ties of childbearing discussion network*
Control variables	**Migration experiences:** Age at first migration (numerical), Times back home per year Years of living in urban areas (1)Years from first migration to survey year -attitude; (2)Years from first migration to year 2nd child was born- behavior
	Individual characteristics: Gender & Marital status, Education, Sex composition of ever born children, Residence region before migration

***Note: See next page.**

Note: Social network factors

(1) Overall effect of childbearing discussion network members

Overall effect of network members = $\sum_{i}^{n} I_i \times A_i \quad i \in (1, 2, \cdots, n).$

- ✓**No effect (Overall effect of network members=0, Ref.)**
- ✓**Negative effect (Overall effect of network members <0)**
- ✓**Positive effect (Overall effect of network members >0)**

***I*: degree of intimacy of a network member:**

- **Very intimate (value=5), Intimate (value=4), ordinary (value=3), Not very intimate (value=2) , Not intimate at all (value=1);**

***A*: attitude of a network member:**

- **Without son preference ("stop bearing"; value=1),**
- **Weak son preference ("have a second child and stop"; value=0),**
- **Strong son preference ("have more children until have a boy"; value=-1);**

n: Number of network members;

Note: In analysis of son preference behavior, only effects of those network members whom respondents knew before the pregnancy of their second birth are considered (assume those members' attitudes never change).

(2) Weak ties of childbearing discussion network

- **No weak ties (Ref.)**
- **Have weak ties (*Network members are managers, owners of private enterprise, professional and technical personnel, and officers*)**

Descriptive Result

(1) Attitude of son preference after migration

Definition	Percentage(%)
No son preference	37.1
Weak son preference	55.9
Strong son preference	7.0
Sample size	1739

Only a minority of rural-urban migrants report strong son preference after migration.

(2) Behavior of son preference after migration

Sex ratio of migrants' children born after migration

	Total number of children	Boys	Girls	Sex ratio	Confidence region (95%)	χ^2 test
Total	718	445	273	163.0	140.5~190.1	33.051***
Birth order						
First birth	441	266	175	152.0	126.0~184.8	14.522***
Second birth	224	144	80	180.0	138.2~239.7	21.891***
Third birth and above	53	35	18	194.4	114.1~371.3	4.832*

Note: *** P<0.001, ** P<0.01, * P<0.05.

The sex ratios of rural-urban migrants' children born after migration are significantly higher than normal, suggesting that migrants' childbearing behaviors have strong son preference.

→In sum, migrants' attitude and behavior towards childbearing after migration still exhibit son preference.

Regression results of son preference among rural-urban migrants

Variable	Attitude of son preference (B)		Giving birth to a boy (B)	
	Model 1	Model 2	Model 3	Model 4
Social network factors				
Overall effect of network members (no effect)				
Negative effect (with son preference)	-1.384***	-1.183***	-0.715	-0.963
Positive effect (without son preference)	1.491***	1.313***	-1.316*	-1.354+
Weak ties (no)				
Yes	0.534**	0.558**	-0.081	
Migration experience				
Age at first migration		-0.018+		-0.105*
Years of living in urban areas (<1 year)				
1-4		0.711*		
5-7		0.590*		-0.446
8+		0.304		-0.906+
Times back home per year (2+)				
1		0.067		0.190
0		0.190		-0.623
Individual factors				
Gender (female)				
Male		-0.102		
Marital status (never-married)				
Ever-married		0.151		
Education (Elementary school and below)				
Junior high school		0.165		1.086*
Senior high school		0.525**		1.108
Children ever born (no child)				
Only boy*		-0.358		
Only girl		-0.631*		2.286***
Both boy and girl		-0.928***		
Residence region before migration(Eastern)				
Central		0.300*		-0.032
Western		0.680***		-0.126
-2LL	146.119***	2170.167***	227.344	173.963***
Sample	1483		186	

Notes: *** P<0.001, ** P<0.01, * P<0.05, +P<0.1; Reference categories appear in parentheses.

* The reference category in Model 4

Regression results:

(1) Attitude of son preference (Model 1 and 2)

- The risk of having son preference tends to decrease when the overall effect of network member is positive (without son preference) and in presence of weak ties;
- The older the migrants at first migration, the higher the likelihood of having son preference;
- Duration of living in cities, and education, have negative effects on the risk of having son preference.
- The odds ratio of having son preference is lower for migrants having only boys.
- Those migrating from central and western regions are less likely to have son preference compared with those migrating from eastern regions.

(2) Behavior of son preference (Model 3 and 4)

- The odds ratio of having a boy at second birth tends to decrease when the overall effect of network members is positive (without son preference).
- Increase in age at first migration decreases the risk of having a boy.
- Compared with those living in urban areas no more than one year, the risk of having a boy is lower among those living in urban areas for 8 years and above.
- Migrants with a higher educational level are more likely to have a boy at second birth.
- In model 4, the likelihood of having a boy is 9.836 ($e^{2.286}$) times greater for migrants whose first child is a girl than for those whose first child is a boy.

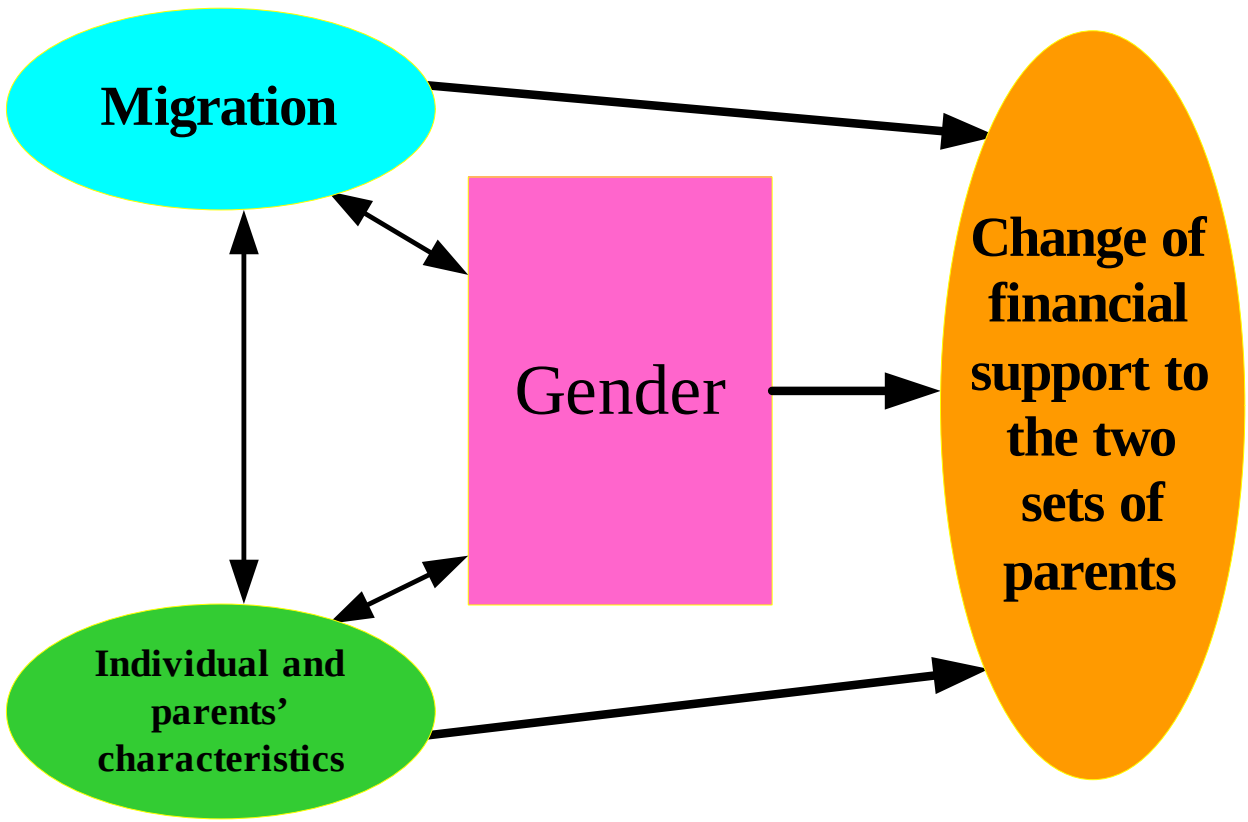
Conclusion

- The majority of rural migrants have the attitude of son preference, but the proportion of the migrants reporting strong son preference is very low.
- The sex ratios of the migrants, children are significantly higher than normal, increasing with birth order. The childbearing behavior of these migrants exhibits strong son preference.
- The changes of their attitude and behavior of son preference are mainly driven by interpersonal influences.
- Age at first migration and sex configuration of ever-born children are important factors influencing son preference.
- With years of living in urban areas increasing, the attitude of son preference tends to be weaker, as does the behavior of son preference. Individuals' attitude and behavior of son preference are influenced by the period effect.
- The change in childbearing behavior lags far behind the change in attitude, and the period effect of the migration appears in the long run.

1. Statistical analysis

1.2 Effects of care-givers' out-migration on old-age support

Analysis Framework



Samples

- **To analyze the effect of children's migration on financial support to parents and parents-in-law, samples were restricted to those married before migration;**

- **Since married children coresiding with their parents usually share the same household economy with their parents in rural China, samples were also restricted to those did not coreside with their parents.**

Models

Dependent variables	**1. Whether the amount of financial support to parents after migration was increased (Logistic Regression Model);** **2. Amount of financial support to parents after migration (OLS Regression Model)**
Independent variable	**Gender of out-migrating children**
Control variables	**Migration experiences:** Years since first out-migration, times back home per year
	Individual characteristics: Age, education, number of offspring, spouse living in home town, income, spouse's income, effect of current financial help to one set of parents on other set of parents
	Parents' characteristics: Survival status, age, physical status, coresiding with individual's children, coresiding with other married children, main source of income, current financial help to child

Descriptive Results

Changes in amount of financial help after migration

- **Gender difference in the mean increment of financial help:**

  _Significant in financial help to parents-in-law;

  _Not significant in financial help to parents;

  _Females increase financial help to two sets of parents while males only increase financial help to natal parents.

- **Difference in financial help to parents and parents-in-law:**

  _Males: Financial help before migration is higher for parents-in-law than for natal parents, but it reverses after migration;

  _Females: Financial help is always much higher for parents-in-law than for natal parents before and after migration, but it tends to be reduced after migration.

Mean increment in annual financial help after migration by gender (yuan)

	Gender	Samples	Mean	t test
Increment of gross help* to parents	Male	254	673.10	ns
after migration	Female	168	647.92	
Increment of gross help to parents-in-law	Male	254	-128.50	*
after migration	Female	168	1060.48	
Increment of net help* to parents	Male	254	869.05	ns
after migration	Female	168	843.69	
Increment of net help to parents-in-law	Male	254	-94.57	*
after migration	Female	168	1076.08	

Note: *Gross help: Upward flow from children to parents;

*Net help: Difference between upward and downward flows between children and parents

Data: Sample survey, "Survey of Rural-urban Migrants in Shenzhen", 2005.

Comparison of mean amount of financial help before and after migration (yuan)

	Samples	To parents			To parents-in-law		
		Before migration	After migration	t test	Before migration	After migration	t test
Gross help							
Male	254	843.58	1516.69	***	860.59	732.09	ns
Female	168	745.54	1393.45	***	1131.98	2192.45	***
Net help							
Male	254	458.82	1327.87	***	720.39	625.83	ns
Female	168	453.04	1296.73	***	878.64	1954.72	***

Data: Sample survey, "Survey of Rural-urban Migrants in Shenzhen", 2005.

Regression Results

Likelihood of increasing the amount of financial support after migration is affected by:

- **Gender:**

  Female migrants are more likely to increase the amount of financial support to their parents-in-law after migration;

- **Migration experience:**

  Longer duration of out-migration helps raise the likelihood of increasing the amount of financial support to parents, but no linear relationship;

- **Individual characteristics:**

  Age, income, giving financial help to other set of parents;

- **Parents' characteristics:**

  Physical health status, living arrangements, main financial source, whether they provide financial help to migrant children.

Odds ratios of logistic regression for children's likelihood of increasing the amount of financial support after migration

Variables	Gross help		Net help	
	Parents	Parents-in-law	Parents	Parents-in-law
Gender				
Female(Male)	1.023	2.044*	.984	1.745+
Migration experiences				
Years since first out-migration: (0-1)				
1-5	2.165	1.279	2.032	1.631
5-7	6.274**	1.468	5.264**	1.418
7^{+}	4.904**	2.393	4.345**	2.158
Individual Characteristics				
Age: (29^{-})				
30-39	.739	1.268	.518+	1.336
40^{+}	.459	.999	.271**	.887
Income: (800^{-})				
801-1000	1.014	.990	.911	.966
1001-1500	2.098*	1.344	1.945+	1.219
1501+	1.332	.944	1.400	.823
Current financial help to other set of parents: (No)				
Yes	2.353*	4.003**	1.831+	3.900**
Parents' characteristics				
Coresiding with respondent's children: (No)				
Yes	1.485	1.855*	1.275	1.484
Main source of income from children: (No)				
Yes	1.635+	.807	1.902*	.915
Current financial help to child: (No)				
Yes	.594+	1.147	/	/
-2LL	511.07**	520.33***	497.67**	534.14**
Samples	422			

Note: Estimates of some control variables included in the regression models are not shown.

Data: Sample survey, "Survey of Rural-urban Migrants in Shenzhen", 2005.

Regression Results

Actual amount of financial support after migration is affected by:

- **Gender:**

  Female migrants give more financial support to their parents-in-law after migration;

- **Individual characteristics:**

  Income, education, spouse's income, giving financial help to other set of parents;

- **Parents' characteristics:**

  Parental living status, living arrangements, main financial source, whether they provide financial help to migrant children.

***Migration experience has no significant effects;**

Estimates of OLS regression for the actual amount of financial support after migration

Variables	Gross help		Net help	
	Parents	Parents-in-law	Parents	Parents-in-law
Gender				
Female(Male)	-.019	.261***	.007	.291***
Individual Characteristics				
Education: (Elementary school and lower)				
Junior high school	.140*	.010	.150*	.085
Senior high school and above	.184**	.012	.165*	.087
Spouse living in hometown: (No)				
Yes	-.116*	.097+	-.136*	.051
Income: (800˙)				
801-1000	.102+	.007	.048	.010
1001-1500	.057	.027	.052	.008
1501+	.245***	.074	.209**	.063
Spouse's income: (800˙)				
801-1000	.018	.114*	.007	.082
1001-1500	.013	.172**	.015	.107*
1501+	-.026	.107+	-.029	.090
Current financial help to other set of parents: (No)				
Yes	.144**	.064	.122*	.061
Parents' characteristics				
Parent alive: (Both alive)				
Only father alive	-.119*	-.017	-.115*	-.024
Only mother alive	-.071	-.046	-.054	-.092+
Coresiding with respondent's children: (No)				
Yes	.203***	.194***	.156**	.157**
Main source of income from children: (No)				
Yes	.191***	.036	.198***	.100+
Current financial help to child: (No)				
Yes	.022	.125**		
R^2	.237***	.289***	.191***	.259***
Samples	**422**			

Note: Estimates of some control variables included in the regression models are not shown.

Data: Sample survey, "Survey of Rural-urban Migrants in Shenzhen", 2005.

Conclusion

- **Gender difference: Females are likely to give parents-in-law more financial support**
  → ***Patrilineal family system is still dominant;***

- **Both males and females provide more financial help to natal parents after migration**
  → ***Out-migration of females could change the traditional pattern of old-age support and might weaken son preference in rural China;***

- **Grandparents receive more remittance when they take care of grandchildren**
  → ***Intergenerational transfer between parents and their migrant children is reciprocal.***

2. Descriptive statistics of whole networks

- **Degree**
  - For directed network, the in-degree of node i is the number of ties received by i and the out-degree is the number of ties initiated by i.
- **Density**
  - The density of a binary network is the total number of ties divided by the total number of possible ties.
- **Degree centrality**
  - The average of out-degree or in-degree (average out-degree equals average in-degree).
- **Degree centralization**
  - The variance of every individual's degree centrality, including out-degree centralization, in-degree centralization.
- **Betweenness centralization**
  - The variance of paths that every individual is on the geodesic of two other individuals.
- **Transitivity**
  - The number of triples which are transitive divided by the number of triples which have the potential to be transitive.
- **Reciprocity**
  - The number of mutual relations divided by the number of actual existing asymmetric relations in whole network among dyads.

2. Descriptive statistics of whole networks

Instrumental Support Network

Site	HM	AMT	XYX	CZ	SZ
Density	0.011	0.086	0.049	0.022	0.021
Degree centrality	2.225	6.360	4.356	2.926	0.957
Out-degree centralization	0.125	0.324	0.280	0.053	0.090
In-degree centralization	0.054	0.118	0.110	0.106	0.068
Betweenness centralization	0.142	0.116	0.093	0.075	0.003
Transitivity	0.191	0.377	0.320	0.303	0.489
Reciprocity	0.129	0.190	0.104	0.176	0.125

2. Descriptive statistics of whole networks

Childbearing Discussion Network

Site	HM	AMT	XYX	CZ	SZ
Density	0.006	0.020	0.018	0.010	0.021
Degree centrality	2.110	1.507	1.589	1.296	0.957
Out-degree centralization	0.116	0.157	0.175	0.050	0.090
In-degree centralization	0.008	0.048	0.039	0.065	0.068
Betweenness centralization	0.030	0.025	0.051	0.004	0.003
Transitivity	0.121	0.215	0.267	0.289	0.489
Reciprocity	0.090	0.076	0.044	0.061	0.125

2. Descriptive statistics of whole networks

- Density and degree centrality for most AMT, XYX and HM networks are larger, which indicates there are more connections in these three networks than in CZ and SZ;

- Out-degree centralization is bigger than in-degree centralization among all the networks. Distribution of the number of members seeking help is more dispersed than that of those contacted for help;

- Connections of discussion network are fewer compared with those in social support networks, indicating there is less communication on topics of marriage, childbearing, contraceptive use and aging life than social support.

3. Fit to model

– **Two famous network structures**

- Small-world network
- Scale-free network

Three important parameters for network with n nodes

– **Average Clustering coefficient *C***

$$C = \frac{\text{Sum of clustering coefficient for each node}}{n}$$

– **Average path length *l***

$$l = \frac{\text{Sum of minimal length between each pair of nodes}}{n}$$

– **Degree distribution in real networks**

3. Fit to model

Four types of networks:

	Average path length	Clustering coefficient	Degree distribution
Regular Network	Big	Big	\
Random Network	Small	Small	***Poisson distribution***
Small World Network	Small	Big	\
Scale Free Network	Small	Big	***Power law distribution***

3. Fit to model

- **For small-world phenomena:**
  - 100 random networks corresponding to each surveyed network are created with the same size and number of ties;
  - Compared with the corresponding random network, if a survey network simultaneously has a large clustering coefficient and a small average distance, it has small-world properties.
- **For scale-free property:**
  - Degree distribution of the scale free network obeys a power law, namely, $P(k) \sim k^r$, where k is the degree and r is the degree exponent.
  - The 35 surveyed networks are directed, so the in-degree and out-degree distribution may not be the same.

3. Fit to model

3.1 Small-World Phenomena

Remarks: In the following table:

- $<k>$ is the average degree,
- l is the average path length. C is the clustering coefficient.
- l_{rand} is the average path length and C_{rand} is the clustering coefficient of the corresponding random network.
- Notes:
  - ***P<0.001, **P<0.01, *P<0.05, +P<0.1
  - "/": Only one pair of individuals discussed contraception in SZ, so these parameters are not calculated.

3. Fit to model

3.1 Small-World Phenomena

Statistical results for average path length and average clustering coefficient

Sites	Parameters	ISN	t Test	ESN	t Test	SCN	t Test	MDN	t Test	CDN	t Test	CoDN	t Test	ADN	t Test
HM (200)	<*k*>	2.225		2.140		2.520		1.705		1.150		0.675		0.935	
	L	5.505	***	7.412	***	5.775	***	5.112	***	3.684	***	2.216	***	2.554	***
	L_{rand}	5.934		6.174		5.323		7.545		6.976		2.563		4.975	
	C	0.124	***	0.118	***	0.123	***	0.113	***	0.101	***	0.152	***	0.135	***
	C_{rand}	0.012		0.012		0.013		0.008		0.006		0.004		0.005	
AMT (75)	<*k*>	6.360		3.893		5.547		2.440		1.507		0.827		1.840	
	L	2.885	***	3.791	***	2.943	***	3.934	***	2.609	***	1.569	***	3.799	***
	L_{rand}	2.512		3.240		2.677		4.440		5.573		2.766		5.421	
	C	0.296	***	0.214	***	0.269	***	0.185	***	0.150	***	0.044	***	0.162	***
	C_{rand}	0.086		0.052		0.075		0.032		0.021		0.013		0.025	
XYX (90)	<*k*>	4.356		3.389		4.511		2.022		1.589		0.722		1.911	
	L	3.649	***	3.995	***	3.330	***	2.481	***	4.359	***	1.366	***	2.498	***
	L_{rand}	3.125		3.648		3.063		5.358		6.021		2.484		5.471	
	C	0.239	***	0.231	***	0.233	***	0.151	***	0.232	***	0.157	***	0.193	***
	C_{rand}	0.051		0.040		0.052		0.024		0.018		0.009		0.022	
CZ (135)	<*k*>	2.926		2.585		3.541		1.289		1.296		0.430		1.304	
	L	5.205	***	3.629	***	5.361	***	2.063	***	2.354	***	1.200	***	1.998	***
	L_{rand}	4.459		4.874		3.918		6.568		6.555		1.680		6.820	
	C	0.243	***	0.240	***	0.253	***	0.204	***	0.178	***	0.239	***	0.187	***
	C_{rand}	0.021		0.019		0.027		0.009		0.010		0.003		0.008	
SZ (47)	<*k*>	2.043		1.702		1.936		0.723		0.957		0.064		0.723	
	L	1.641	***	1.722	***	2.1	***	1.340	***	1.339	***	/	/	1.209	***
	L_{rand}	4.370		4.609		4.4462		2.248		2.983		/		2.247	
	C	0.446	***	0.400	***	0.374	***	0.180	***	0.360	***	/	/	0.322	***
	C_{rand}	0.043		0.037		0.042		0.016		0.025		/		0.021	

3. Fit to model

3.1 Small-World Phenomena

- **Small-world phenomena exist in most of the 35 networks (small average length and large clustering coefficient)**
  - Since “relatives” and “fellow countryman” are important in rural migrants’ networks, cliques with numerous ties are common. “Local contacts ” in Watts’ model
  - Special network members, such as labor contractors, may introduce more heterogeneous connections. “ Random long-range shortcuts ” in Watts’ model
- **Comparing the 7 types of networks in each survey site:**
  - Average degree of social support networks is larger than that of discussion networks. Some intimate topics, especially sexual behavior, are rarely discussed and the number of discussants is quite limited.

3. Fit to model

3.1 Small-World Phenomena

- Average path length of social support networks is generally larger than that of discussion networks. Individuals' relations in social support networks are weaker than in social discussion networks.
- Average clustering coefficient for social support networks is generally larger than for discussion networks. Rural-urban migrants may pay more attention to instrumental transfer.
-

- **Comparing the same network among five survey sites:**
  - Generally, male-dominated networks (CZ and SZ) have smaller average degree than female-dominated networks (HM, AMT and XYX). Females are more open than males to being in networks.

3. Fit to model

3.2 Fit to Scale Free Network

Regression results for log $P(k)$ and log k

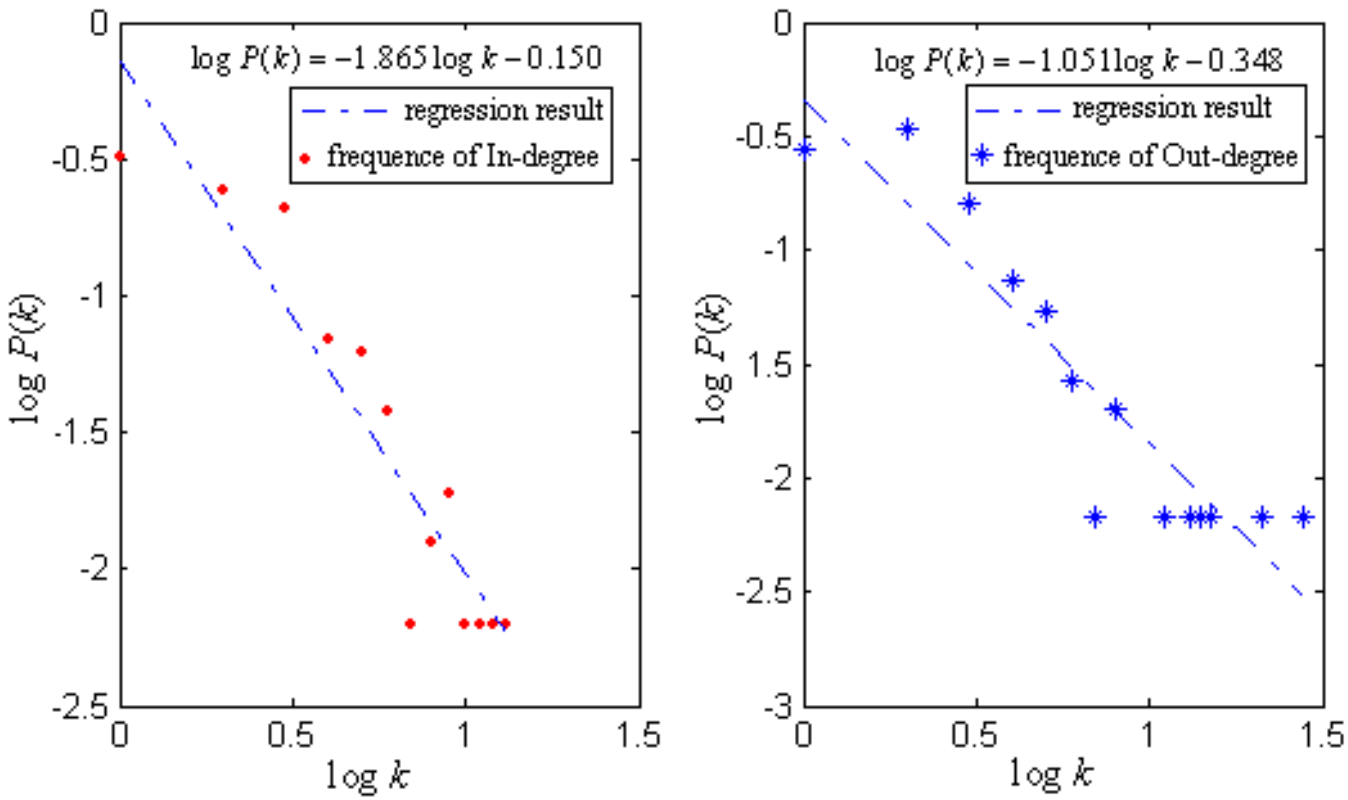
networks	parameters	HM		AMT		XYX		CZ		SZ	
		r	R^2	r	R^2	r	R^2	r	R^2	r	R^2
ISN	in-degree	-1.865***	0.872***	-0.119	0.009	-1.068*	0.575*	-1.448*	0.842***	-0.961*	0.756*
	out-degree	-1.501***	0.854***	-0.653*	0.550*	-0.807***	0.602***	-1.206*	0.528*	-1.145*	0.902*
ESN	in-degree	-1.513***	0.827**	-1.059*	0.612*	-1.148*	0.626*	-1.582***	0.808***	-0.924*	0.689*
	out-degree	-1.481***	0.886***	-1.078***	0.837***	-0.957***	0.675***	-1.308*	0.645*	-1.103*	0.726*
SCN	in-degree	-1.715***	0.873***	-0.318	0. 110	-0.835*	0.514*	-1.282***	0.800***	-0.984*	0.926*
	out-degree	-1.473***	0.924***	-0.750*	0.575*	-0.768***	0.600***	-0.991^{+}	0.415+	-1.118*	0.936*
MDN	in-degree	-2.051***	0.828***	-1.336*	0.794*	-1.558*	0.753*	-1.779*	0.863*	-2.227*	0.946*
	out-degree	-1.496***	0.882***	-1.158*	0.752*	-0.890*	0.747*	-0.979*	0.875*	-0.452	0.375
CDN	in-degree	-2.065***	0.909***	-1.640*	0.849*	-1.467	0.615	-1.830*	0.847*	-1.685+	0.825+
	out-degree	-1.445***	0.842***	-0.931*	0.650*	-0.838***	0.930***	-1.194*	0.735*	-1.199	0.602
CuDN	in-degree	-2.162*	0.873*	-1.306	0.867	-2.159*	0.941*	-2.404	0.912	/	/
	out-degree	-1.212*	0.784*	-0.935	0.602	-0.237	0.207	-0.784^{+}	0.555+	/	/
ADN	in-degree	-1.985***	0.916***	-1.113*	0.759*	-1.791*	0.780*	-1.994*	0.832*	-1.842	0.967
	out-degree	-1.212***	0.884***	-0.904*	0.648*	-0.706***	0.678***	-1.266*	0.691*	-0.922	0.661

Notes: ***P<0.0001, **P<0.001, *P<0.05, +P<0.1

"/": Only one pair of individuals discussed contraception in SZ, in-degree and out-degree distributions are omitted.

3. Fit to model

3.2 Fit to Scale Free Network

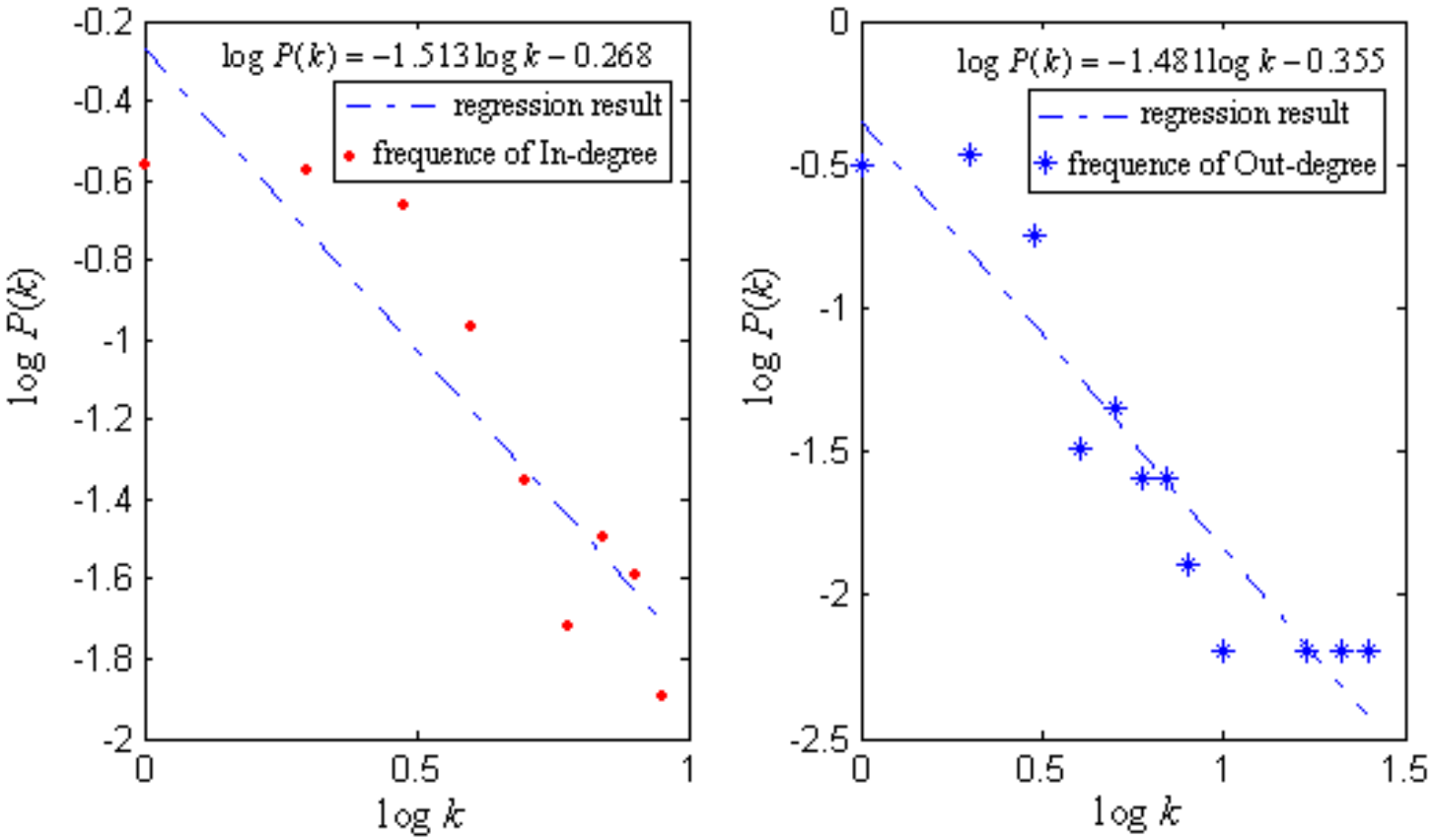


(a) In-degree (b) Out-degree

Fig. 1. Degree distribution of HM's instrumental support network

3. Fit to model

3.2 Fit to Scale Free Network

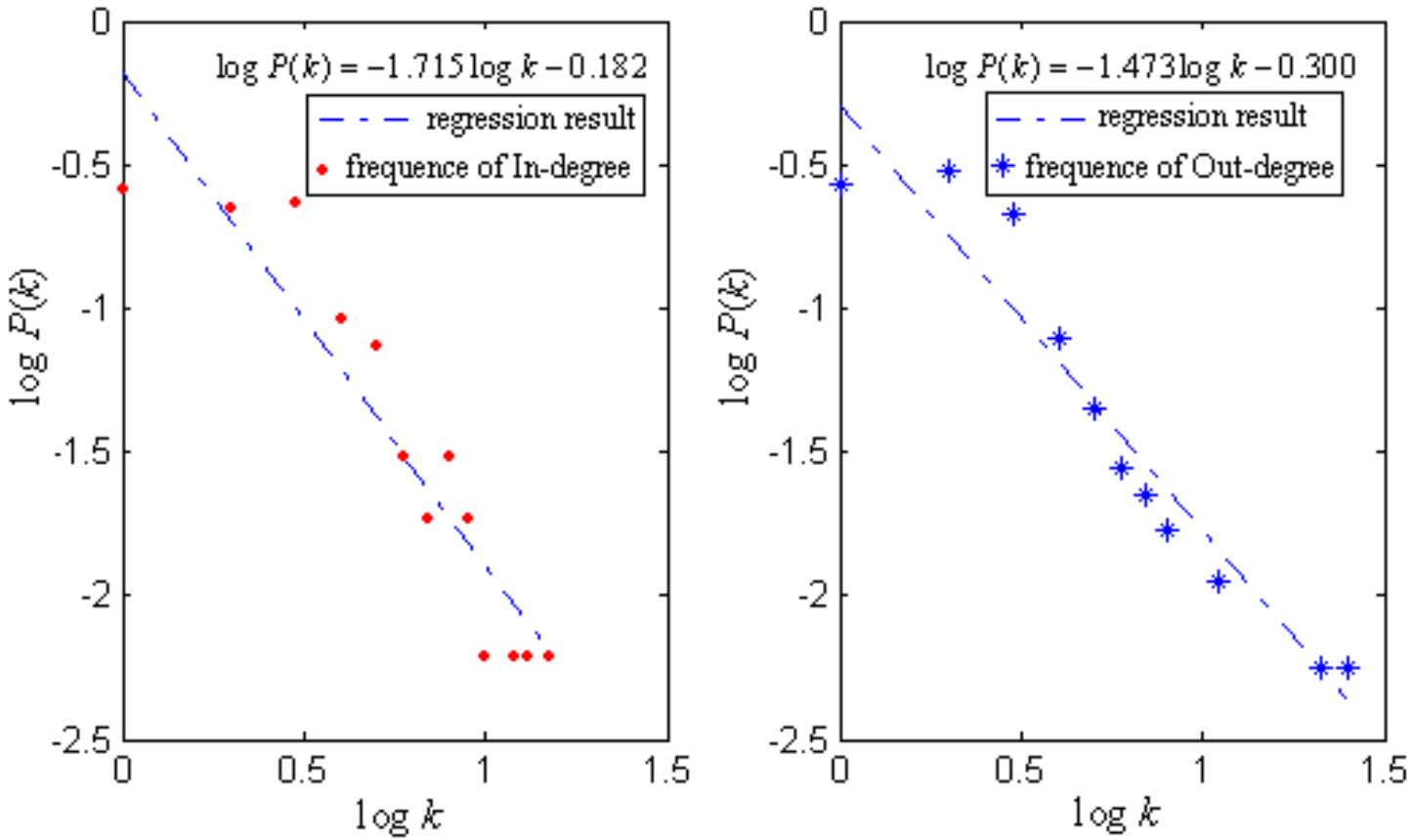


(a) In-degree (b) Out-degree

Fig. 2. Degree distribution of HM's emotional support network

3. Fit to model

3.2 Fit to Scale Free Network

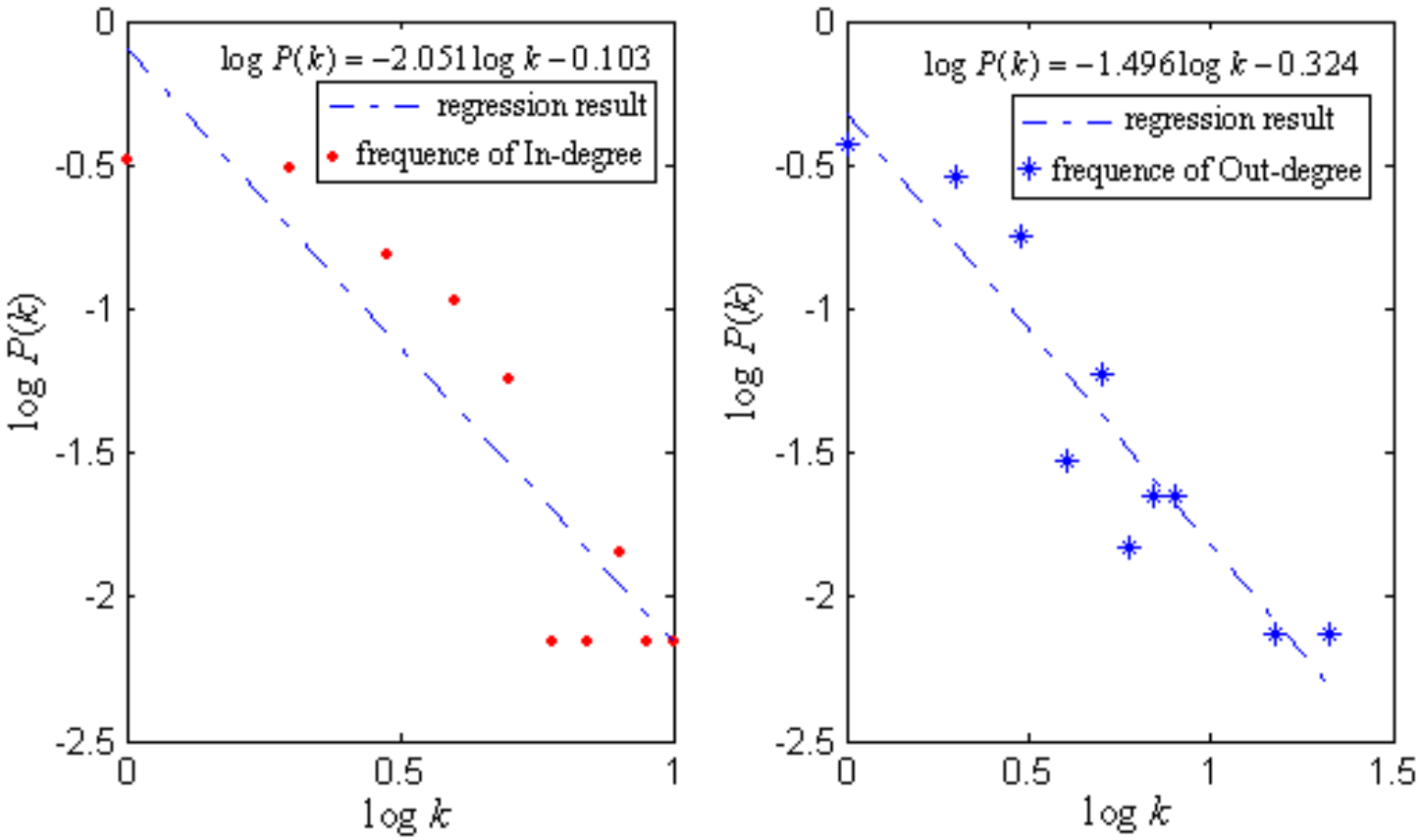


(a) In-degree (b) Out-degree

Fig. 3. Degree distribution of HM's social contact network

3. Fit to model

3.2 Fit to Scale Free Network

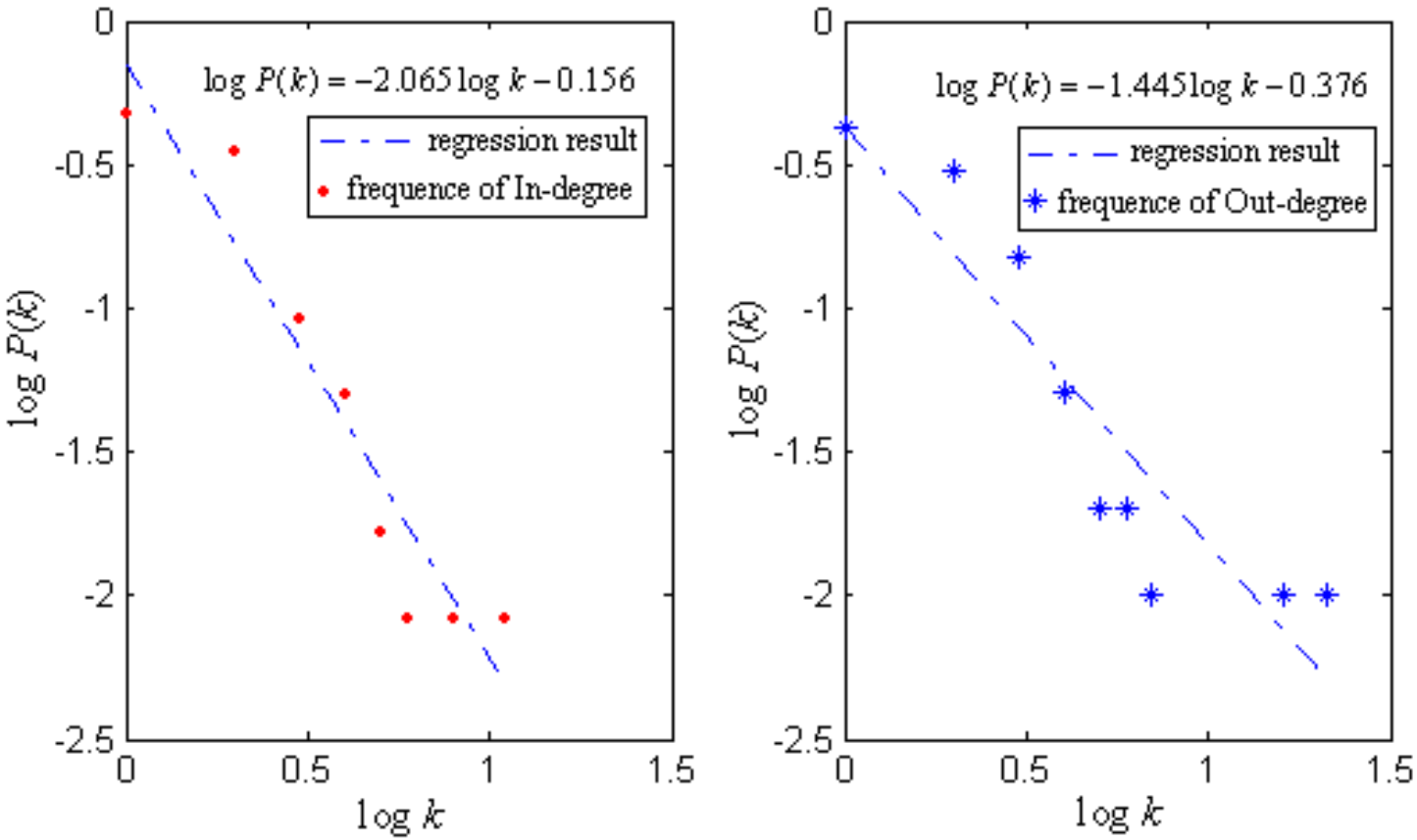


(a) In-degree (b) Out-degree

Fig. 4. Degree distribution of HM's discussion network focusing on marriage

3. Fit to model

3.2 Fit to Scale Free Network

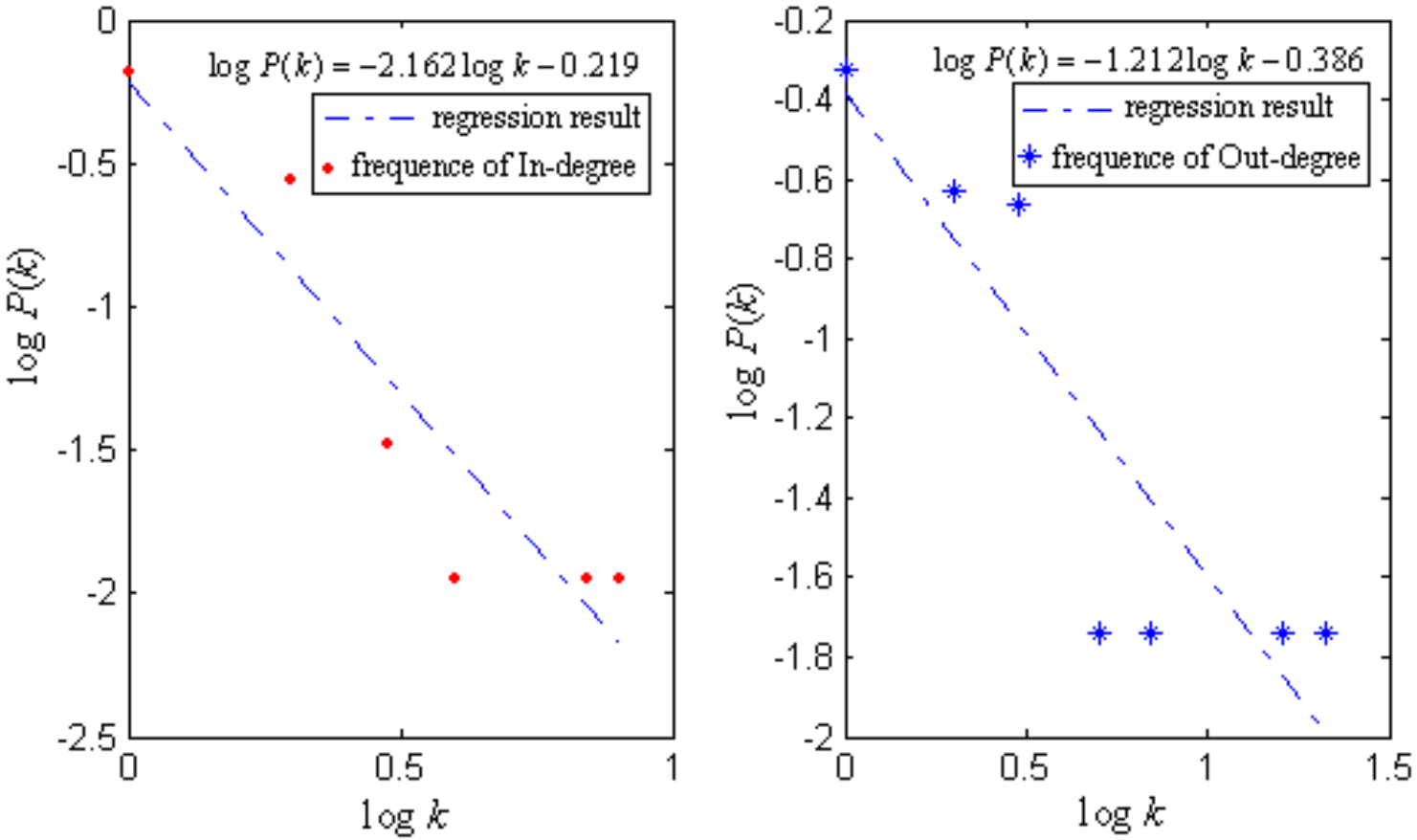


(a) In-degree (b) Out-degree

Fig. 5. Degree distribution of HM's discussion network focusing on childbearing

3. Fit to model

3.2 Fit to Scale Free Network

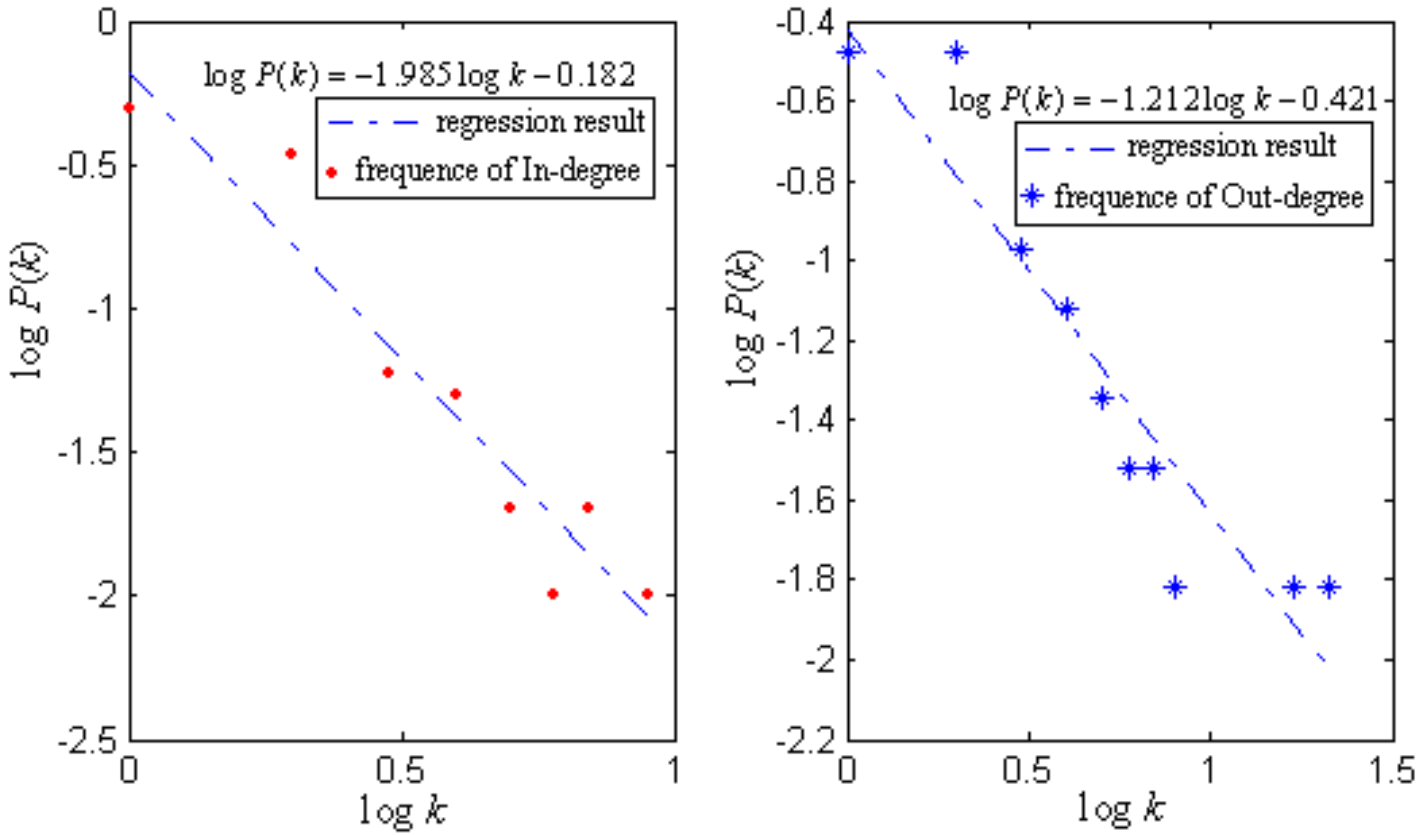


(a) In-degree (b) Out-degree

Fig. 6. Degree distribution of HM's discussion network focusing on contraception

3. Fit to model

3.2 Fit to Scale Free Network



(a) In-degree (b) Out-degree

Fig. 7. Degree distribution of HM's discussion network focusing on ageing life

3. Fit to model

3.2 Fit to Scale Free Network

- The degree distributions of the 35 networks fit **power law distribution** (namely, **$P(k) \sim k^r$**) better than Poisson distribution;
  - The labor contractors always control a group of migrants and occupy more social resources than ordinary migrants. They act as “hubs” of the social networks.

3. Fit to model

3.2 Fit to Scale Free Network

- The **degree exponent *r*** is different from that of the traditional scale-free network (Barabàsi model, *r* =-3, Barabàsi et al, 1999);

  → **Barabàsi model needs modification.**

- The out-degree and in-degree distributions are different in social discussion networks, but almost the same in social support networks.
  - For the social discussion networks, the probability of an individual giving information to *k* other individuals is higher than that of receiving. Rural-urban migrants may be apt to active participate in social discussion.

4. Community structure

4.1 Concept

A property that seems to be common to many networks is **community structure**, the division of network nodes into groups within which the network connections are dense, but between which they are sparser

-----M. E. J. Newman

4. Community structure

4.1 Concept

- Cohesive subgroup, social group, clique…

- Detection
  - Computer science approaches
  - Sociological approaches
  - Newman's algorithms

- Evaluation
  - Sociological measure (Wasserman & Faust)
  - Modularity (Newman)

4. Community structure

4.1 Concept

Evaluation : modularity

Consider a particular division of a network in to *m* communities. Define evaluation matrix *E*:

$$e_{pq} \in \boldsymbol{E}_{m\times m}$$

Here e_{pq} is the fraction of edges in the original network that connect nodes in community *p* to those in community *q*

4. Community structure

4.1 Concept

Evaluation : modularity

$$Q = \sum_{c=1}^{m} \left[e_{cc} - \left(\sum_{i} e_{ci} \right)^2 \right]$$

The greater the value of Q, the stronger is the community structure of the network.

Values of Q typically fall in the range 0.3-0.7.

4.2 Results:

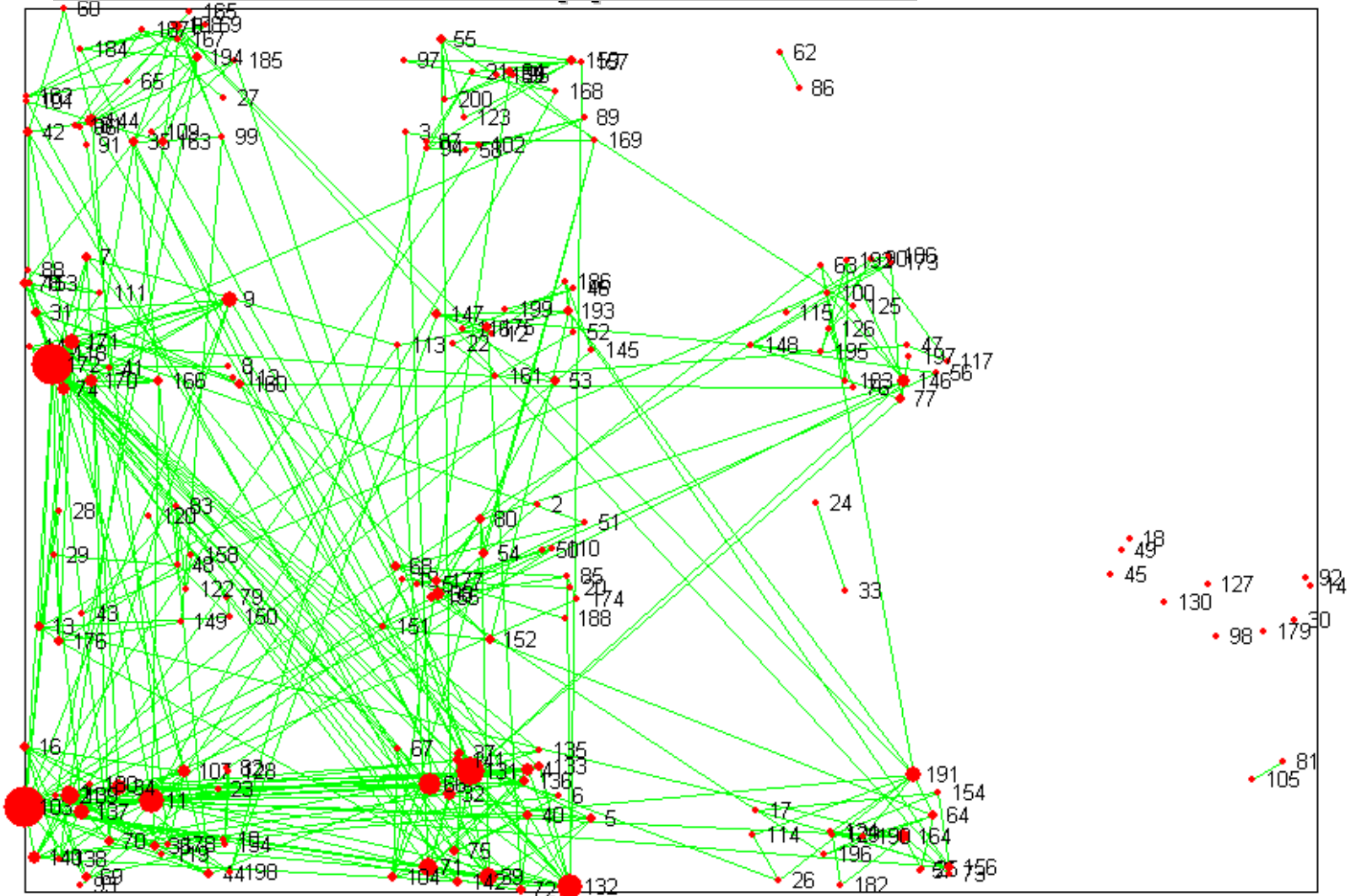
I. Modularity

Survey sites	ISN	ESN	SCN	MDN	CDN	CoDN	ADN
HM	0.547	0.578	0.545	0.643	0.673	0.740	0.676
AMT	0.376	0.455	0.378	0.523	0.6117	0.685	0.519
XYX	0.462	0.498	0.422	0.526	0.591	0.605	0.589
CZ	0.711	0.717	0.702	0.760	0.742	0.783	0.787
SZ	0.691	0.683	0.725	0.760	0.775	/	0.794

4.2 Results:

II. Examples of community structure (a):

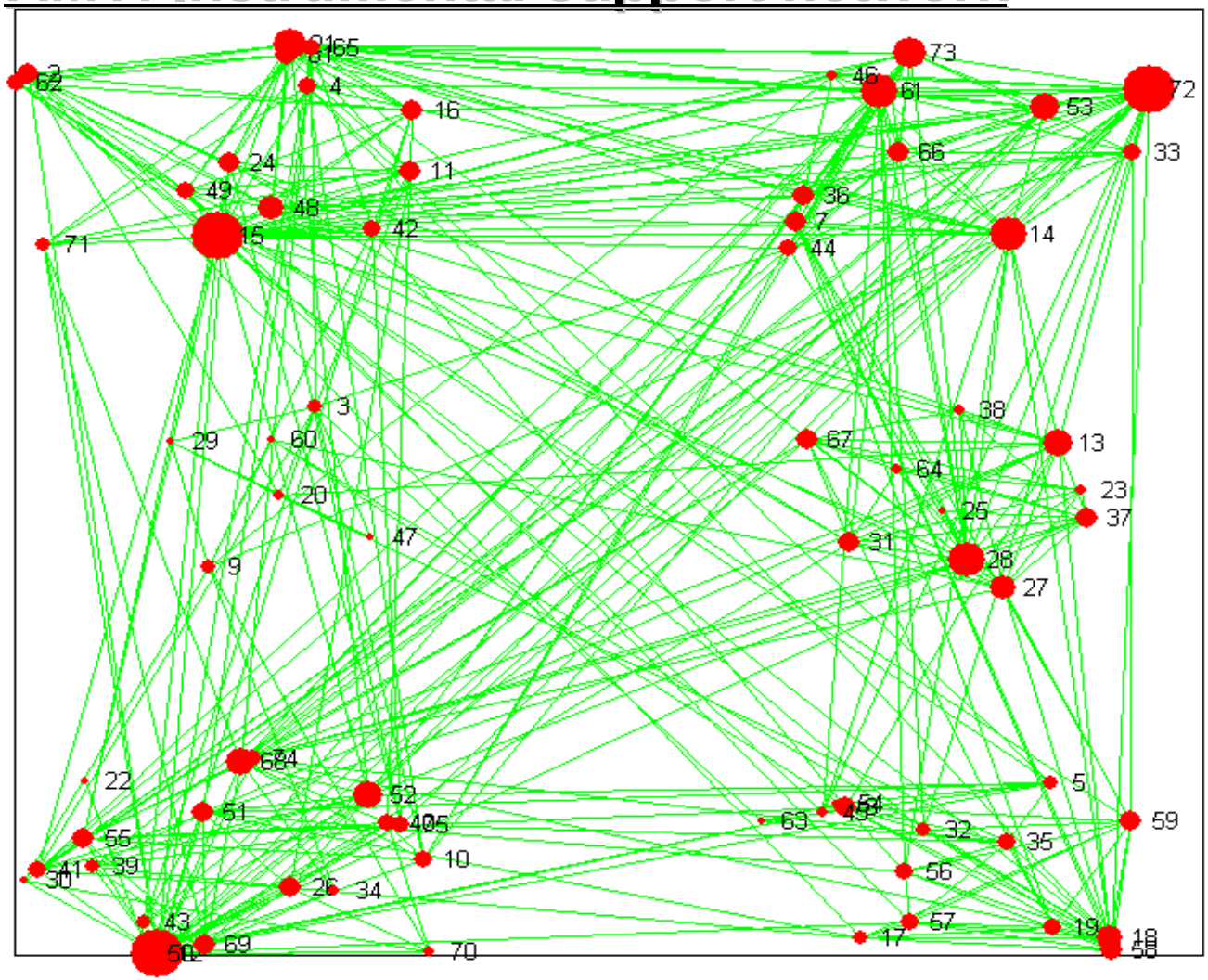
HM-Instrumental support network



4.2 Results:

II. Examples of community structure (b):

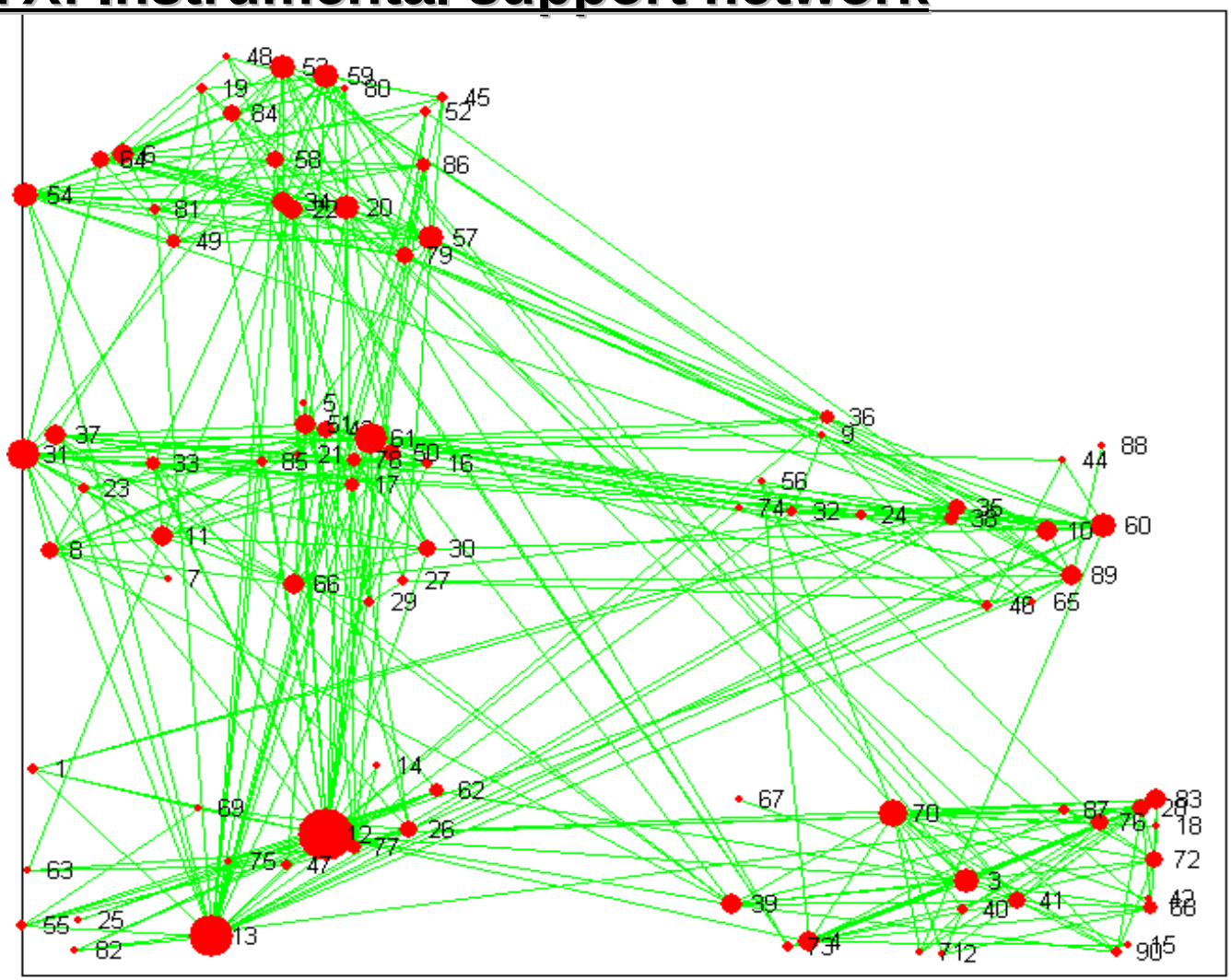
AMT: Instrumental support network



4.2 Results:

II. Examples of community structure (c):

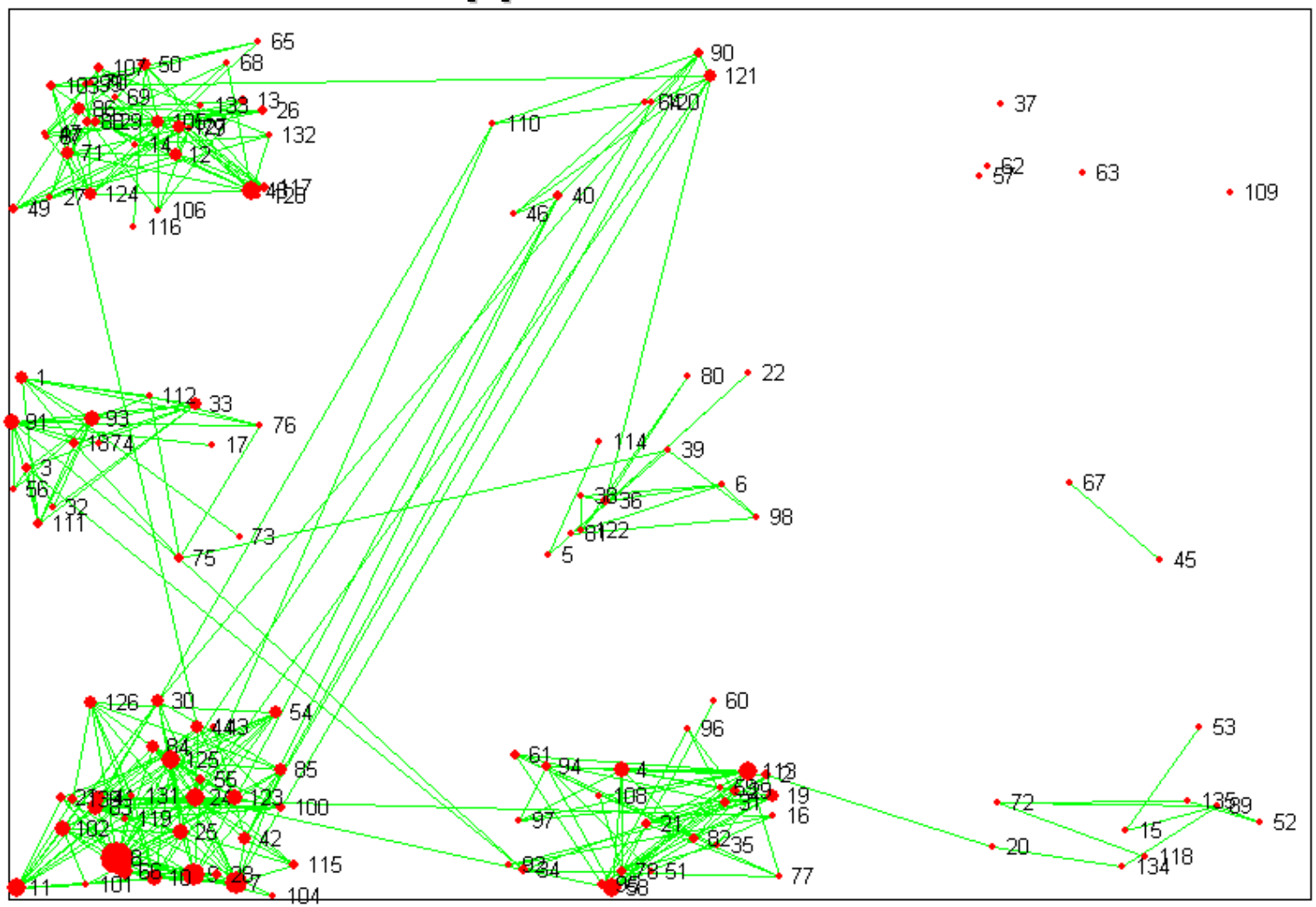
XYX: Instrumental support network



4.2 Results:

II. Examples of community structure (d):

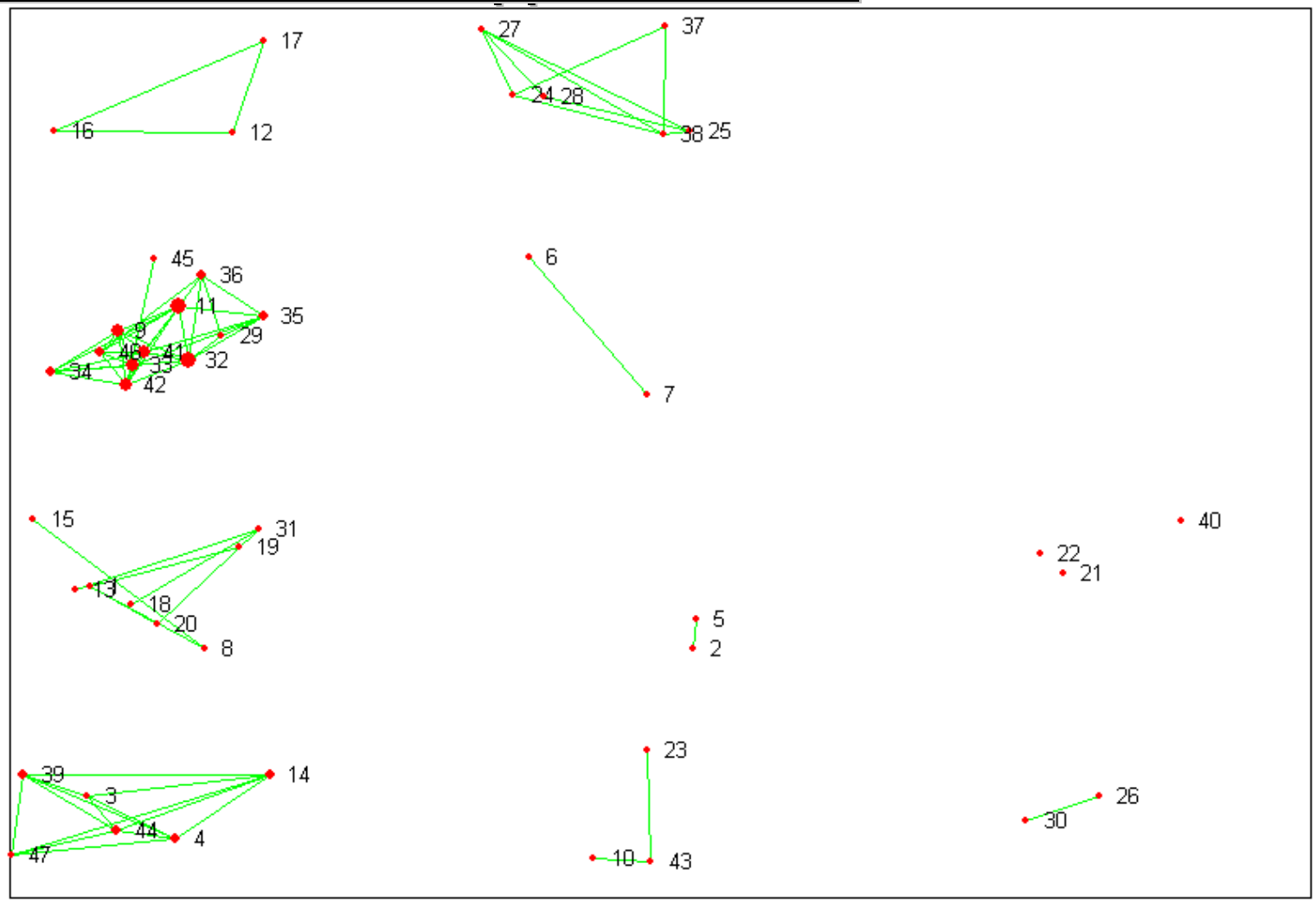
CZ: Instrumental support network



4.2 Results:

II. Examples of community structure (e):

SZ: Instrumental support network



4.2 Results:

III. Some findings:

- The social networks of our sample have clear community structures ;
- The community structures of social discussion networks are much stronger than social support networks ;
- Community structures are stronger for men’s networks than for women’s .

5. Current and future works

5.1 General analysis

– **Statistical analysis**:

- Determinants and outcomes of job-seeking networks and other social support networks;
- Determinants of attitudes and behaviors about marriage, childbearing, contraceptive use, old-age life etc.
- Socio-demographic implications of rural-urban migration
- Social integration, public policy analysis and promotion strategies

– **Social network analysis**:

- Structure of the social network: P* model (Wasserman, S. & P. Pattison, 1996; Anderson, J., S. Wasserman, & B. Crouch, 1999)
- Weighted social network analysis
- New classification or clustering algorithms

5.2 Attitude and behavior transmission model based on the social network

- **The evolution of the social network model**

  To simulate the evolution of the social networks' structure.

- **Contagion model and Autocorrelation model**

  To analyze the influence of whole networks on the transmission of attitudes and behaviors.

- **Agent based models for attitude and behavior diffusion among rural-urban migrants**

  To provide a simulation platform, and to analyze or predict the transmission of an attitude across the whole network.

Thanks for your attention!