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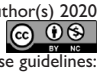

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Does Descending Resources Reform Improve Patient Satisfaction and Reshape Choice of Care Providers? A Cross-Sectional Study in Zhejiang, China

Zesheng Sun, PhD[1], Shuhong Wang, PhD[2,3], Hongjun Zhao, PhD[1], and Haiming Yu, PhD[4]

Abstract

Patient satisfaction and choice of care providers have been the core concerns of China's descending resources reform launched in 2013. This health care reform attempts to improve low-level hospitals' capability and patient satisfaction through compulsory descending of doctors from high-level hospitals, thereby reshaping patients' behavior (loyalty). The goal of this paper is to explore the determinants of patient satisfaction, and its impact on patient loyalty with an emphasis on low-level hospitals in the reform context. By using a self-made 5-point scale that incorporates socio-demographic variables, reform, and revealed preference into the European Consumer Satisfaction Index model (ECSI), cross-sectional data from 17 hospitals, and 1287 questionnaires in Zhejiang province is collected to conduct empirical research. Satisfaction is measured as ordinary variables with the reform and with the low-level hospitals, respectively. Loyalty is measured by patients' willingness to choose low-level hospitals when suffering illness or severe illness. Analysis of variance and multiple comparisons are utilized to examine the different level of hospitals. An ordered logit model and ordinary least squares regression are applied to examine the determinants of satisfaction and loyalty. The results indicate that patient satisfaction can be explained by variables of perceived quality, patient expectations, and corporate image. Socio-demographic variable, providers, and the reform also have significant effects. Patients' satisfaction plays a pronounced role on improving their loyalty. The descending resources reform positively affects low-level hospitals' capability and patient satisfaction. The cost reduction and convenience significantly increase the reform satisfaction. Capability, medical environment, and accessibility of descending doctors are positively associated with the satisfaction with low-level hospitals. This paper evidences that the descending resources reform is an effective way to reallocate resources in supply side of health service market and reshape patients' choice of care providers with the accessibility and spillover of descending human capital.

Keywords

descending resources reform, health services, patient satisfaction, consumer behavior, choice of care provider, cross-sectional studies, analysis of variance, regression analysis, China

What do we already know about this topic?

China's descending resources reform attempts to reallocate health resources between urban and rural regions but its impact on patient satisfaction and choice of care providers has not been explored by prior studies.

How does your research contribute to the field?

This paper for the first time explores the impact of the descending resources reform from the patient perspective through a representative sample of pilot reform provinces in China.

What are your research's implications toward theory, practice, or policy?

This paper evidences that the descending resources reform is an effective way to reallocate resources and reshape patients' choice of care providers, and the accessibility and spillover of descending human capital improve patients' satisfaction and loyalty to low-level hospitals.

Introduction

Unbalanced allocation of health resources between urban and rural regions not only generates medical costs and efficiency losses but also triggers serious inequality, doctor-patient conflicts, and detrimental social consequences.[1] During the past 2 decades, the Chinese government has adopted a series of healthcare policy reforms to correct the unbalanced allocation of health resources. These reforms were initiated by investments in the infrastructure of the primary health care facilities after the severe acute respiratory syndrome (SARS) crisis in 2003. More government health expenditure, the expansion of medical insurance coverage and the abolishment of marked-up drug prices policy have been implemented since 2009. However, structural congestion, characterized by the overcrowding of urban high-level hospitals and resource idleness in low-level hospitals, has not been sufficiently addressed; the efficiency of low-level hospitals has not improved yet.[2] Low use and capability of low-level hospitals are still important challenges for China.[3]

The reason for China's structural congestion mainly lies in 2 aspects. The first is that past investment focused on fixed assets rather than human capital; the second is the past reforms mainly impacted on patient's affordability from perspective of demand side, but not biased resource allocation and choice of care providers from perspective of supply side. Therefore, low-level hospitals fail to address the discrepancy in human capital with high-level hospitals and win back patients' trust. Since 2013, Zhejiang and other provinces have launched the descending health resources reform (see Column 1),[4] which is very different from developing countries' reforms that focus on designing different health resource formulae and financing mechanisms.[5] In 2014, Chinese President Xi Jinping bolstered the measures implemented in this reform, and in subsequent years, this reform had been gradually expanded to other provinces. In 2017, this reform was incorporated into a broader goal of people-centered integrated care. This supply-side reform attempts to descend human capital from high-level hospitals to low-level hospitals, and narrows the gaps among hospitals via the spillover effects of human capital. Finally, it aims at improving patient satisfaction and rebalancing patients' care provider choices with an emphasis on low-level hospitals.Column 1

The descending healthcare resources reform of Zhejiang, China

- Double descendings: Resources and personnel from urban high-level hospitals should be descended to all county-level hospitals, and those from county-level hospitals should be descended to all town-level hospitals. All province-level general hospitals/specialty hospitals should establish cooperative ties with no less than 4 or 2 county-level hospitals. No less than 5% qualified doctors with intermediate or above professional titles should descend to low-level hospitals. More than 80% of the descending doctors should have intermediate or senior professional titles.
- Two promotions: By the end of 2017, approximately 90% of patients should be treated in hospitals within their counties with a significant promotion of diagnosis/treatment capability and patient satisfaction. The government provides financial subsidies for all levels of hospitals involved in the reform to (at least partially) compensate for their reform costs.

Source. Zhejiang Province Government.[4]

Marketing theories have used the consumer satisfaction index model since 1990s to measure factors affecting clients' satisfaction. Three representative models can be identified: the Swedish Customer Satisfaction Barometer (SCSB model) emphasizes the determinants of 2 antecedent factors: customer expectations and perceived performance; customer satisfaction then affects customer complaints, which ultimately impacts customer loyalty.[6,7] The American Customer Satisfaction Index model (ASCI) adds latent variable of perceived quality but still measures perceived performance with perceived values.[8] Brady and Cronin[9] emphasizes evaluation based on the quality of service in the dimensions of outcome, interaction quality, and physical environment quality, which is similar to the ACSI model. The European Customer Satisfaction Index model (ECSI) initiated by the EU Commission in 1999, removes customer complaints from the ACSI and SCSB models, since complaint handling has no significant effect on customer satisfaction or loyalty in empirical studies.[10] However, ECSI model includes corporate image to incorporate customers' memory associations with organizations[11]; satisfaction mediates between service quality and loyalty.[12,13] The above studies provide a

[1]School of Finance and Business, Shanghai Normal University, China
[2]Department of Stomatology, Tongde Hospital of Zhejiang Province, Hangzhou, China
[3]Department of Stomatology, First People's Hospital of Akesu, China
[4]School of Economics and Management, Zhejiang University of Science and Technology, Hangzhou, China

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Corresponding Author:
Shuhong Wang, Department of Stomatology, Tongde Hospital of Zhejiang Province, No. 234, Gucui Road, Xihu District, Hangzhou 310012, China.
Email: wangshh@126.com

comprehensive analytical framework for exploring the determinants of satisfaction and loyalty in service industry.[14]

Patient satisfaction emerged as an issue of interest for health service researchers and health organizations since 1970s. It has been recognized that patient satisfaction is the result of the interplay between perspective of the patients and the providers on quality of care.[15] Patients' expectations, personal beliefs, and value orientation would influence their evaluation.[16] Thus, satisfaction can be expressed as a function of patients' preferences and their expectations of medical service.[17] Strasser and Davis[18] designed a framework that contains consumers' socio-demographics variable, current experience, satisfaction formation, and behavioral choices. It is similar to the analysis of customer expectations, perceived quality, and perceived value on satisfaction in marketing research. Some recent literature also highlighted the importance of health literacy on patient's evaluation of services.[19] Patients' responsive behaviors also correspond to the variable of customer loyalty. Health service satisfaction empirical studies also highlight the impact of socio-demographics variable.[20] Socio-demographics variable such as age, gender, and educational level affect patient satisfaction.[21,22] However, such effects are dynamic and contextual, which requires a broader institutional and social structure for analysis.[23] The possible solution is to incorporate care providers' characteristics, market structure or exogenous institutional variables into the study.[24-26]

Recent studies have noted the impacts of China's healthcare reforms with industry-level data, but haven't involved the descending resources reform.[2] Patient satisfaction literature using China's micro data considers socio-demographic variables,[27,28] market structure, income, and medical insurance status.[23] Other researches on developing countries utilize scales to evaluate the relationships among service quality, satisfaction, and loyalty.[29] However, these studies treat the institutional environment as given, and this assumption is inconsistent with that of developing countries experiencing rapid-evolving healthcare system and reform.

The existing studies have provided useful but limited research perspectives because the patient satisfaction analysis framework treats the care system as exogenous, and cannot be generalized to developing countries like China. In this study, our goal is to incorporate the impact of health reform into an analytical framework of patient satisfaction, and assess the effects of China's descending resources reform on patient satisfaction and choice of care provider with an emphasis on low-level hospitals. In addition, we adopt characteristics of the latest-visit hospital as variables of patients' revealed preference, taking China's social welfare system and the transitional health care system into account to explain the differences among patient satisfactions and provider choices. Since the ongoing descending resource reform is a new attempt to reallocate health resources, the findings will provide empirical evidence of the reform's effect. To the best of our knowledge, this is the first paper to explore the impact of the descending resources reform from the patient perspective through a representative sample of pilot reform provinces in China.

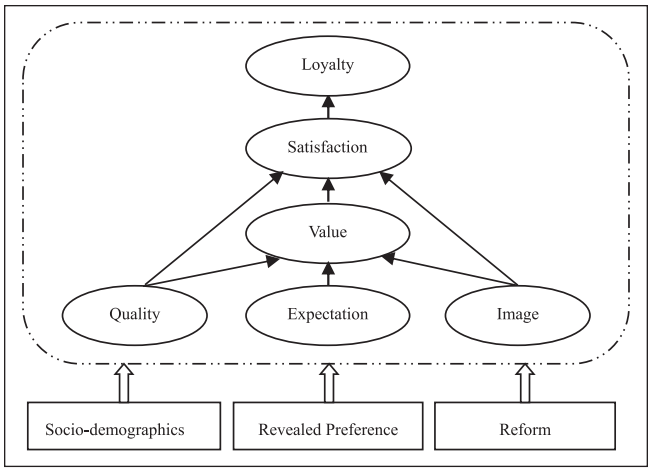

Figure 1. The theoretical model of patient satisfaction.
Note. The ESCI model is shown inside the dotted line.

Methods

Theoretical Model

We adopt the European Consumer Satisfaction Index model as the basic model in this study, extending it with 3 exogenous variables: descending resources reform, revealed preferences, and socio-demographics variable (Figure 1). Patient satisfaction is affected by 3 latent variables: perceived quality (*Q*), consumer expectation (*Exp*), and corporate image (*Im*). The difference between consumer's expectation and perceived outcome is expressed as expected value. However, since the technical reliability and treatment effects of medical services are too complex for patients to evaluate,[30] the perceived value cannot be observed directly. However, patients can use other non-technical characteristics to evaluate the expected value of medical services.[31]

Referring to Pan et al[23] and utility theory in economics, we set S_i as the patient satisfaction generated by receiving medical services in industry level or at specific hospital levels. We use U_2 as perceived utility level, which is subject to the effects of the latent variables in the ESCI model and the control variables. EU_1 represents the mathematical expectation of the expected utility, which displays the average utility that all sampled patients would experience for medical services. Therefore, we obtained:

$$S_i = U_2(Q_i, Exp_i, Im_i, Control) - EU_1(Q_i, Exp_i, Im_i)$$

Patients' socio-demographics variables are included in *Control*. These variables can measure patient's average

individual attributes in a particular group.[32] To examine the discrepancies in personal preferences, we adopt the preference theory of economics to measure patients' revealed preference based on their latest visit. This is because if a patient has chosen a particular hospital, the hospital selected for the latest visit can disclose his/her personal preference information. Additionally, the descending resources reform can affect patient satisfaction in 2 ways: first, the reform fundamentally changes the low-level hospitals' capability; second, the reform information can be transmitted to patients. Therefore, we use the differences of measurement variables to incorporate the change of low-level hospitals due to the reform; and, we introduce reform awareness and the channel as control variables into the model and obtain:

$$\Delta S_i = U_2^{'}(\Delta Q_i, \Delta Exp_i, \Delta Im_i, Control)$$

According to utility theory, consumers always choose the combination of goods or services that maximizes their utilities. Let loyalty being the proxy of patients' future choice of care providers,[33] we have:

$$\Delta Loyalty_i = f(\Delta S_i, Control)$$

According to previous studies,[34,35] ΔS_i and $\Delta Loyalty$ should be converted into a linear function of the variable matrix X and Z:

$$\Delta S_i = X_i\beta + \varepsilon_i^*$$
$$\Delta loyalty_i = Z_i\gamma + \varepsilon_i$$

Where X is set of measurement variables and *Control,* Z is set of patient satisfaction and *Control,* β *and* γ are regression coefficients, ε^*_i and ε_i are error term.

Questionnaire Design and Variables

The measurement variables, question items, and their definitions in the questionnaire are reported in Table 1, where ordered variables used five-point unbalanced scale in order to incorporate the reform effects. First, China's hospital system is divided into 3 levels: (1) tertiary hospitals, are typically located in provincial capitals and cities as high-level hospitals; (2) secondary hospitals, are usually county-level hospitals or district-level hospitals in cities; and (3) primary hospitals, are at the town-level in rural area or community health service centers in the city. Both secondary and tertiary hospitals provide outpatient and inpatient services. Apart from public health functions, primary hospitals only offer outpatient services. Therefore, patient satisfaction in this paper includes 2 items: the reform satisfaction at the industry level, and satisfaction with the low-level hospitals. Patient loyalty is measured with 2 questions: "*the intention to choose local low-level hospital first*," and "*the intention to choose local low-level hospital first when suffering serious illness*."

Socio-demographics variables contain gender, age, education level, and insurance status. Among them, insurance status includes urban medical insurance (UBMI), new rural cooperative medical insurance (NRCMI), commercial insurance, and non-insurance under China's current social welfare system. The literature emphasizes the use of hospital size, ownership, and staffing per bed to measure the provider's characteristics.[25] However, the descending resources reform covers only public hospitals, and private hospitals have a tiny market share in China, so we do not consider the variable of ownership. Since the number of beds at the primary hospitals is 0, the staffing per bed is excluded. We include the staff number and the beds number to measure the size of the hospital. The data is obtained from interviews with the hospitals' human resource department.

As for the latent variables of the ESCI model, Clavolino and Dahlgaard[36] believe that expectations related to the prior anticipations regarding the service. Because the descending resources reform involved high-level and low-level hospitals, we introduce capability of low-level hospitals and accessibility of descending doctors from high-level hospital as measurement variables. Besides, consumers' expectations are related to medical cost, which is also included in the measurement. As for perceived quality related to the associated services, we consider environment and convenience as 2 measurement variables. Corporate image refers to the brand name and associations the customer has with the hospital. Patient trust in low-level hospitals provides a basis for future collaborations.[37] Patients' awareness of the descending high-level hospitals/doctors is adopted to measure the degree of image implantation to certain low-level hospital. The 2 factors were used to measure the corporate image.

The data used in this study covers 17 public hospitals in Zhejiang province, including 3 primary hospitals, 8 secondary hospitals, and 6 tertiary hospitals. In each hospital, interviews of randomized outpatients are conducted by trained independent investigators using self-made questionnaires and face-to-face interviews; those refuse to participate and give incomplete information would be treated as invalid questionnaires. The respondents who complete it could receive a gift of $1 (7 RMB Yuan) for their time. The survey was performed from September 2018 to April 2019.

Empirical Method

Since the sample covers 3 different levels of hospitals, we use the one-way analysis of variance (ANOVA) to determine whether there are significant differences among patients at various levels of hospitals. If the results of an F-test in the ANOVA reach the threshold value ($\alpha = .05$), the mean of the 3 groups is significantly different. Next, the

Table 1. Questionnaire Design, Variable and Its Definition.

Latent variables	Question items	Measurement variables	Definition or data source
Satisfaction	*The satisfaction for the descending resources reform*	Y	1-5 ordinary variables based on evaluation from very low to very high
	The satisfaction for local low-level hospital	Y_1	1 for negative change, 2 for no change, 3-5 for ordinary positive change, the same below
Socio-demographics	*Your gender*	Gender	1 for male and 0 for female
	Your age	Age	1 for ≤30, 2-5 for 31-40, 41-50, 51-60, and ≥61, respectively
	Your education level	Education	1 for primary or below, 2-5 for junior, high school, college or university, graduate degree, respectively
	Your kind of insurance	Insurance	1 for the coverage of UBMI, NRCMI, commercial insurance, respectively, 0 otherwise
Revealed preference	*The number of medical staff for the hospital of latest visit*	Staff	The sum of healthcare workers of the hospitals
	The number of sickbeds for the hospital of latest visit	Beds	The hospitals
Perceived quality	*The environment change of local low-level hospital*	Environment	1-5 ordinary variables
	The change of convenience to receive healthcare service	Convenience	1-5 ordinary variables
Patients' expectation	*The diagnosis/treatment capability change of local low-level hospital*	Capability	1-5 ordinary variables
	The accessibility to the descending doctors	Access	1-5 ordinary variables
	The medical cost change	Cost	1-5 ordinary variables
Image	*The trust for local low-level hospital*	Trust	1-5ordinary variables
	Your awareness for the descending high-level hospitals and doctors	Aware	1-5 ordinary variables based on evaluation from very low to very high
Reform policy	*Your recognition for the descending resources reform*	Reform	1-5ordinary variables based on evaluation from very low to very high
	The channels for receiving policy information	Channel	1 for public channels of newspaper, TV and hospital, private channels being 0
Loyalty	*The intention to choose local low-level hospital first*	Loyal	1 for negative change, 2 for no change, 3-5 for ordinary positive change, the same below
	The intention to choose local low-level hospital first when suffering serious illness	Loyal_A	1-5 ordinary variables

multiple posteriori comparison method is used to compare the differences among the groups using the Turkey HSD test and Scheffe's method.

Since S_i, *Loyalty*, and measurement variables are ordinary, we use the ordered logit model (OLM) for estimations. According to Ferrer-i-Carbnell and Frijters[38] as well as Clavolino and Dahlgaard,[36] the ordinary least squares (OLS) approach can also provide a valid estimate of the model and directly explain the marginal effects of the estimated coefficients. Therefore, we also use the results of the OLS estimation as a robustness test for the ordered logit model estimates. To eliminate the influence of different dimensions, we use the natural logarithm of hospital size.

Results

Reliability and Validity Analysis

We obtain 1354 questionnaires, of which 1287 are valid. The effective rate is 95.05%, and correlation coefficients between measurement variables are lower than 0.60. We first use SPSS 23.0 software and reliability tests to assess the reliability and consistency of the scale and data. The results show that the Cronbach's α coefficient is 0.915. In general, a Cronbach's α coefficient of over 0.80 can be regarded as good. Therefore, the scale and data have good internal consistency. We also test the validity of the questionnaire by using factor analysis method. The result indicates that the

Kaiser-Meyer-Olkin (KMO) value is 0.901, and the Bartlett spheroid test value is 9223.199 (Sig. = 0.0001). The results indicate that the questionnaire has good structural validity, so the scale and data is suitable for empirical analysis.

Descriptive Statistics

Table 2 shows the summary statistics for the sample variables. Regarding the descending resources reform, 60% of the respondents express "moderate," "high," or "very high" levels of satisfaction, while the rest indicates satisfaction of "very low" and "low" (mean = 2.70). This evaluation is analogous to reform awareness (mean = 2.36), where 64% of the respondents obtained reform information from public sources. For low-level hospitals, approximately 87% of the respondents show "positive," "high" and "very high" levels of satisfaction. Additionally, 10% of the respondents have unchanged satisfaction levels, and only 1% believes that their satisfaction has declined. In terms of socio-demographics variables, women account for the majority of the sample (58%). The average age is between 2 = "31-40 years" and 3 = "41-50 years" (mean = 2.35). The average education level is approximately 3 = "high school" (mean = 2.88). The majority of the sample is covered by medical insurance of various types. Most of them have UBMI and NRCMI coverage, which accounts for 52% and 29%, respectively. However, approximately 5% and 14% of the respondents have commercial insurance or no insurance, respectively. For care providers, the average staff number and bed number are 595.20 and 431.67.

For measurement variables, the average medical cost is 2.80 (2 = "no change," 3 = "slight decrease"), indicating that the descending resources reform lowers medical cost in general. The environment, capability, convenience and trust for low-level hospitals all have means between 3.2 and 3.4 (3 = "positive," 4 = "high"), suggesting that the reform has a positive impact from patients' perspective. The respondents' average awareness for descending high-level hospitals/doctors is 2.50, which is between 2 = "low" and 3 = "moderate." However, the mean score for the accessibility of the descending doctors reaches 3.10, which is between 3 = "positive" and 4 = "high," indicating that the respondents consider it easy to access the descending doctors from high-level hospitals.

As for the loyalty variable, the average score for "*the intention to choose local low-level hospital first*" is 3.30, and variable *Loyal_A* that measures patient loyalty when suffering serious illness also reaches 3.20 (3 = "positive" and 4 = "high"). The results indicate that after the descending resources reform, patients prefer to choose lower-level hospitals.

ANOVA and Multiple Comparisons

Table 2 also presents the comparisons of variables among various levels of hospitals. The ANOVA finds that education level, insurance status, reform awareness, capability, convenience, trust, accessibility, satisfaction, and loyalty variables all differ significantly among different levels of hospitals ($\alpha = .05$). However, no significant differences exist for medical environment, medical cost, age, and gender.

The results of multiple comparisons show that patients' reform satisfaction in tertiary hospitals is significantly higher than that in the primary and secondary hospitals. There is no significant difference between the primary and secondary hospitals. This result resembles that of reform awareness variable. However, for patient satisfaction with low-level hospitals, no significant difference exists between tertiary and other level hospitals. In contrast, patient satisfaction of secondary hospitals is higher than that of primary hospitals. For socio-demographics variables, education level of patients visiting the tertiary hospitals (mean = 3.34) is significantly higher than those visiting primary and secondary hospitals, with no significant difference between the latter two. In terms of insurance status, differences between groups are significant only among patients with UBMI coverage. Patients visiting primary hospitals with UBMI coverage (mean = 0.44) is significantly lower than other hospital levels. However, no significant difference for patients with UBMI coverage exists between the secondary and tertiary hospitals.

As for the measurement variables, *Capability, Convenience*, and *Trust* are significantly different between the primary and secondary hospitals, with the latter being higher. For variables related to descending high-level hospitals, patients' awareness in tertiary hospitals (mean = 3.02) is significantly higher than that of patients in primary and secondary hospitals (mean = 2.41 and 2.55, respectively). *Access* is significantly higher in secondary hospitals than in primary hospitals, while the tertiary hospitals do not differ from the other 2 levels.

The results of the group comparison of 2 loyalty variables are different. Although patients visiting tertiary hospitals have already chosen high-level hospitals, their willingness to select low-level hospitals is not different from patients visiting other level hospitals. *Loyalty* for secondary hospital is higher than for primary hospitals. However, when patients are seriously ill, their loyalty to low-level hospitals is significantly lower if the latest visit is primary hospital compared with other levels.

Regression Results for Patient Satisfaction

Table 3 provides the OLM estimates of satisfaction as the dependent variable. The estimated coefficients illustrate the effects of socio-demographics variables, reform, preference, and the latent variables on satisfaction. In particular, we adopt 2 different provider-size variables for the estimation.

For the socio-demographics variables, education level negatively impacts on reform satisfaction (*Y*) significantly, while its impact on satisfaction with low-level hospitals (*Y1*) is negative but insignificant. The results suggest that a higher education level is associated with lower *Y* but is not a significant predictor of *Y1*. Gender has a significant negative impact

Table 2. Descriptive Statistics of Key Variables, ANOVA, and Multiple Comparison Results.

	Overall		Tertiary hospital		Secondary hospital		Primary hospital	
Variables	Number	Mean	Number	Mean	Number	Mean	Number	Mean
Patient satisfaction								
Y (for the reform)	1287	2.70	130	3.26^{*,2}	851	2.65^{*,1}	306	2.59^{*,1}
1-very low	410	0.32	28	0.22	302	0.35	80	0.26
2-low	115	0.09	10	0.08	58	0.07	47	0.15
3-moderate	369	0.29	28	0.22	225	0.26	116	0.38
4-high	242	0.19	28	0.22	169	0.20	45	0.15
5-very high	151	0.12	36	0.28	97	0.11	18	0.06
Y1(for low-level hospital)	1287	3.35	130	3.29	851	3.40^{*,1}	306	3.23^{*,1}
1-decrease	16	0.01	6	0.05	4	0.00	6	0.02
2-no change	158	0.12	10	0.08	106	0.12	42	0.14
3-positive	603	0.47	62	0.48	393	0.46	148	0.48
4-high	380	0.30	44	0.34	239	0.28	97	0.32
5-very high	130	0.10	8	0.06	109	0.13	13	0.04
Gender	1287	0.42	130	0.32	851	0.45	306	0.39
Age	1287	2.35	130	2.41	851	2.34	306	2.34
Education	1287	2.88	130	3.34^{*,2}	851	2.81^{*,1}	306	2.87^{*,1}
Kind of insurance								
UBMI	669	0.52	82	0.63^{*,1}	451	0.53^{*,1}	135	0.44^{*,2}
NRCMI	373	0.29	27	0.21	254	0.30	89	0.29
Commercial	69	0.05	2	0.02	43	0.05	21	0.07
No insured (Base group)	176	0.14	19	0.15	93	0.11	61	0.20
Hospital size of the latest visit								
Number of medical staff		595.20		2897.69		434.10		100.00
Hospital beds		431.67		1863.71		331.47		0.00
Awareness for the reform	1287	2.36	130	2.90^{*,2}	851	2.30^{*,1}	306	2.30^{*,1}
Channel of recognition for the reform								
Public	819	0.64	94	0.72	528	0.62	199	0.65
Private	468	0.36	36	0.28	323	0.38	107	0.35
Healthcare cost	1287	2.80	130	2.88	851	2.78	306	2.80
Environment	1287	3.38	130	3.35	851	3.37	306	3.41
Capability	1287	3.35	130	3.28	851	3.41^{*,1}	306	3.22^{*,1}
Convenience	1287	3.27	130	3.29	851	3.33^{*,1}	306	3.10^{*,1}
Trust	1287	3.28	130	3.29	851	3.34^{*,1}	306	3.11^{*,1}
Awareness for the descending high-level hospital and doctors								
Aware	1287	2.50	130	3.02^{*,2}	851	2.41^{*,1}	306	2.55^{*,1}
Accessibility to descending doctors	1287	3.10	130	2.96	851	3.16^{*,1}	306	2.97^{*,1}
Patient loyalty								
Loyal	1287	3.30	130	3.29	851	3.36^{*,1}	306	3.13^{*,1}
1-decrease	17	0.01	5	0.04	7	0.01	5	0.02
2-no change	190	0.23	11	0.08	121	0.14	58	0.19
3-positive	606	0.47	66	0.51	388	0.46	152	0.50
4-high	335	0.26	37	0.28	225	0.30	73	0.24
5-very high	139	0.11	11	0.08	110	0.13	18	0.06
Loyal_A	1287	3.20	130	3.42^{*,1}	851	3.26^{*,1}	306	2.94^{*,2}
1-decrease	31	0.02	6	0.05	19	0.02	6	0.02
2-no change	261	0.20	13	0.10	167	0.20	81	0.26
3-positive	552	0.43	50	0.38	346	0.41	156	0.51
4-high	305	0.24	42	0.32	212	0.25	51	0.17
5-very high	138	0.11	19	0.15	107	0.13	12	0.04
Sample size	1287		130		851		306	

Note. [1] The statistics reported are the amount of sample and its mean. [2] Asterisks and n = 1 or 2 (^{*,n}) denote a statistically significant difference among the different hospital groups with ANOVA ($\alpha = .05$), and the number of difference by using multiple posteriori comparison.

Table 3. The Estimation Result of Ordered Logit and OLS Regression of Patient Satisfaction.

Dependent variable: patient satisfaction (1 = "very low" for Y and "decrease" for Y1, 2 = "low" for Y and "no change" for Y1, 3 = "moderate" for Y and "positive" for Y1, 4 = "high," 5 = "very high"; Y for the reform, Y1 for local low-level hospital)

	Ordered logit regression				OLS regression			
Variable	Model 1: Y		Model 2: Y1		Model 3: Y		Model 4: Y1	
Gender	0.022 (0.119)	0.002 (0.119)	−0.233* (0.130)	−0.237* (0.130)	−0.002 (0.045)	−0.007 (0.045)	−0.046 (0.028)	−0.047* (0.028)
Age	0.024 (0.055)	0.026 (0.055)	−0.035 (0.061)	−0.036 (0.061)	0.024 (0.021)	0.024 (0.021)	−0.009 (0.013)	−0.009 (0.013)
Education	−0.220*** (0.068)	−0.203*** (0.067)	−0.013 (0.073)	−0.014 (0.073)	−0.051** (0.025)	−0.046* (0.025)	−0.007 (0.015)	−0.006 (0.015)
Kind of insurance (base group: "no insured")								
UBMI	0.187 (0.189)	0.190 (0.189)	−0.355* (0.201)	−0.378* (0.201)	0.082 (0.069)	0.085 (0.070)	−0.075* (0.044)	−0.081* (0.044)
NRCMI	−0.130 (0.202)	−0.145 (0.202)	−0.118 (0.217)	−0.138 (0.217)	−0.038 (0.075)	−0.041 (0.075)	−0.021 (0.047)	−0.025 (0.047)
Commercial	0.281 (0.303)	0.261 (0.303)	−0.942*** (0.329)	−0.938*** (0.329)	0.103 (0.113)	0.101 (0.113)	−0.193*** (0.071)	−0.193*** (0.071)
Hospital size of the latest visit								
LnStaff	0.235*** (0.063)		0.022 (0.069)		0.072*** (0.023)		0.010 (0.015)	
LnBeds		0.049** (0.022)		0.041* (0.025)		0.015* (0.009)		0.011** (0.005)
Reform	0.711*** (0.088)	0.719*** (0.088)	0.025 (0.098)	0.020 (0.098)	0.250*** (0.033)	0.253*** (0.033)	0.002 (0.021)	0.001 (0.021)
Reform *Channel	0.203*** (0.058)	0.198*** (0.058)	0.027 (0.068)	0.028 (0.068)	0.105*** (0.023)	0.104*** (0.023)	0.006 (0.015)	0.006 (0.015)
Cost	0.148** (0.076)	0.144* (0.076)	0.326*** (0.084)	0.330*** (0.084)	0.047* (0.028)	0.045 (0.029)	0.073*** (0.018)	0.074*** (0.018)
Environment	0.066 (0.091)	0.062 (0.092)	1.390*** (0.108)	1.410*** (0.108)	0.023 (0.034)	0.022 (0.035)	0.313*** (0.022)	0.317*** (0.022)
Capability	0.072 (0.104)	0.075 (0.105)	1.786*** (0.119)	1.774*** (0.119)	0.016 (0.038)	0.015 (0.038)	0.395*** (0.024)	0.391*** (0.024)
Convenience	0.258** (0.109)	0.265** (0.109)	0.019 (0.117)	0.016 (0.118)	0.118*** (0.040)	0.121*** (0.040)	−0.007 (0.025)	−0.008 (0.025)
Trust	0.465*** (0.109)	0.451*** (0.109)	0.574*** (0.119)	0.568*** (0.119)	0.159*** (0.040)	0.156*** (0.040)	0.141*** (0.025)	0.140*** (0.025)
Aware	1.063*** (0.078)	1.081*** (0.079)	−0.071 (0.081)	−0.064 (0.081)	0.411*** (0.027)	0.418*** (0.027)	−0.013 (0.017)	−0.011 (0.017)
Access	0.100 (0.073)	0.075 (0.073)	0.175** (0.074)	0.174** (0.074)	0.032 (0.026)	0.026 (0.026)	0.041** (0.016)	0.041** (0.016)
Constant/limit points	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2/ Adjusted R^2	0.382	0.380	0.451	0.452	0.682	0.681	0.676	0.677
Observation	1287	1287	1287	1287	1287	1287	1287	1287

Note. [1] Clustered standard error in parentheses. [2] ***, ** and * denote significance level of 1%, 5% and 10%, respectively. [3] Limit points and Pseudo R^2 for ordered logit regression, constant and Adjusted R^2 for OLS regression.

on *Y1*, implying that women are more satisfied than men for low-level hospitals. Compared with the uninsured population, insured patients are negatively associated with *Y1* significantly for 2 types of insurance: UBMI and commercial. However, no significant difference on *Y* is found between the population with and without insurance.

Both *Staff* and *Beds* variables show positive effects on satisfaction *Y* and *Y1*. The difference lies in that, variables of *Staff* and *Beds* all significantly impact on *Y*, but only *Beds*' impact on Y1 is significant at 10% significance level.

Regarding the reform-associated variables, reform awareness significantly pushes up *Y* ($\alpha = .01$), but the effect varies for different information channels. Open channels could further strengthen the impact of reform awareness on satisfaction *Y* compared with private channels. However, reform awareness has positive but insignificant impact on *Y1*, indicating that reform awareness does not affect patients' satisfaction with low-level hospitals.

Among variables of patient expectations, only *Cost* significantly affects reform satisfaction *Y. Capability* and *Access* do not have positive impact on *Y* significantly; in comparison, both variables impact on *Y1* positively at 1% significance level. For variables of perceived quality, *Environment* and *Convenience* have different influences on *Y* and *Y1*: improvement of the medical environment enhances *Y1* but has no significant effect on *Y*. While *Convenience* has a significant positive impact on *Y* but has no significant impact on *Y1*. Finally, for variables of corporate image, *Trust* has a significant positive impact on *Y* and *Y1*. However, awareness for the descending high-level hospital and doctors (Aware) affects reform satisfaction *Y*, but has no significant impact on *Y1*.

To test the robustness of the above results, the right panel of Table 3 reports the estimated results using the OLS model. The results are consistent with that of the OLM estimation. We can obtain the marginal effects of variables based on the estimated coefficients. Overall, the results of the satisfaction regression are robust.

Regression Results for Patient Loyalty

In Table 4, we present the results of the patient loyalty regression using the OLM and OLS approach. Because estimates of hospital size are similar when using *Beds* and *Staff*, we only report the estimates based on *Beds* in Table 4. As before, OLS estimates are used to test the robustness of the OLM regression results.

The results indicate that, 2 satisfaction variables, *Y* and *Y1*, are positively associated with loyalty at 1% significance level in all models. That is, improvements in satisfaction will incentivize patients to choose low-level hospitals first. Reform awareness also positively enhances loyalty for low-level hospitals in the 4 scenarios of model 5 and model 6, with no significant impact of information channels.

For variables of socio-demographics, *Gender* has no significant relationship with loyalty. *Age* shows a negative relationship to loyalty; however, the relationship is insignificant in the situation of suffering severe illness. Education level also plays a negatively role on patient loyalty with robust results in model 5 and model 6. The results suggest that patients with higher education levels have lower loyalty to low-level hospitals. Compared to the uninsured population, the population covered by UBMI and NRCMI shows a higher loyalty. The loyalty of patients with commercial insurance is higher than that of uninsured patients; with the introduction of reform satisfaction, the estimated coefficients are positive but insignificant. Hospital size also has a positive impact on loyalty in all models, indicating that the larger the hospital the patient had recently visited, the more likely the patient would choose low-level hospitals in the future.

The results of the OLS estimates are displayed in the right panel of Table 4, and they fully support the OLM estimation. The results suggest that the positive relationship between patient loyalty and satisfaction is robust.

Discussion

In the analysis, we found that the descending resources reform has improved industry-level satisfaction of patients visiting different levels of hospitals with tertiary hospitals being higher than others. Moreover, the greater a patient's awareness of the reform is, especially for those obtaining information via public channels, the higher their satisfaction with the reform would be. This is because 1 goal of the reform is to reduce the congestion of high-level hospitals; and patients visiting high-level hospitals will benefit from the reform and have a higher reform satisfaction. Low-level hospitals also benefit from the inflow of health resources and capability improvement. Therefore, patients visiting low-level hospitals also increase their satisfaction with the reform. Patients' reform satisfaction is associated with their reform awareness so as to understand its marginal effects. Accessing information via public channels can avoid information transmission distortion, and be helpful to promote satisfaction. This indicates that information supply is essential to enhance reform satisfaction. For satisfaction with low-level hospitals, no significant difference is found between low-level and high-level hospitals. However, patients visiting secondary hospitals have higher satisfaction than those visiting primary hospitals. This result does not relate to reform awareness/information channels. It demonstrates that, since the focus of the reform are secondary hospitals, which receive more human capital inflow and financial subsidies than primary hospitals, leading to the higher satisfaction than primary hospitals. Besides, since patients can easily receive care service of low-level hospitals and feel the change by themselves, their satisfaction with low-level hospitals is not related to reform awareness and information transmission.

For the reform effects, variables on patients' expectation and perceived quality have different impact on satisfaction. Medical cost and convenience positively impact on reform

Table 4. The Estimation Result of Ordered Logit and OLS Regression of Patient Loyalty.

Dependent variable: patient loyalty (1 = "decrease," 2 = "no change," 3 = "positive," 4 = "high," 5 = "very high"; Loyal for the local low-level hospital, Loyal_A for the local low-level hospital when suffering serious illness)

	Ordered logit regression				OLS regression			
Variable	Model 5: Loyal		Model 6: Loyal_A		Model 7: Loyal		Model 8: Loyal_A	
Gender	0.042 (0.108)	0.156 (0.114)	−0.003 (0.106)	0.112 (0.112)	0.006 (0.045)	0.054 (0.037)	−0.009 (0.048)	0.041 (0.040)
Age	−0.215*** (0.050)	−0.112** (0.053)	−0.168*** (0.049)	−0.060 (0.051)	−0.093*** (0.021)	−0.039** (0.017)	−0.080*** (0.022)	−0.023 (0.018)
Education	−0.133** (0.059)	−0.115* (0.062)	−0.131** (0.058)	−0.101* (0.061)	−0.056** (0.025)	−0.031 (0.021)	−0.061** (0.026)	−0.034 (0.022)
Kind of insurance (base group: "no insured")								
UBMI	0.619*** (0.170)	0.671*** (0.178)	0.432*** (0.166)	0.334* (0.174)	0.231*** (0.069)	0.196*** (0.058)	0.183** (0.074)	0.145** (0.062)
NRCMI	0.626*** (0.183)	0.503*** (0.192)	0.578*** (0.179)	0.391** (0.187)	0.224*** (0.075)	0.147** (0.063)	0.228*** (0.080)	0.146** (0.067)
Commercial	0.500* (0.274)	0.717** (0.287)	0.418 (0.267)	0.527* (0.281)	0.207* (0.114)	0.218** (0.095)	0.202* (0.122)	0.213** (0.101)
Hospital size of latest visit								
LnBeds	0.048** (0.021)	0.039* (0.022)	0.099*** (0.020)	0.111*** (0.022)	0.021** (0.009)	0.015** (0.007)	0.045*** (0.009)	0.038*** (0.008)
Reform	0.277*** (0.079)	0.414*** (0.078)	0.302*** (0.077)	0.433*** (0.075)	0.115*** (0.033)	0.138*** (0.025)	0.131*** (0.035)	0.150 (0.027)
Reform *Channel	−0.035 (0.055)	−0.061 (0.058)	−0.019 (0.053)	−0.045 (0.056)	−0.020 (0.023)	−0.022 (0.025)	−0.008 (0.025)	−0.013 (0.020)
Patient satisfaction	0.521[a]*** (0.061)	1.874[b]*** (0.087)	0.489[a]*** (0.060)	1.843[b]*** (0.086)	0.212[a]*** (0.024)	0.603[b]*** (0.023)	0.214[a]*** (0.025)	0.638[b]*** (0.025)
Constant/limit points	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2/ Adjusted R^2	0.100	0.245	0.101	0.238	0.681	0.460	0.229	0.466
Observation	1287	1287	1287	1287	1287	1287	1287	1287

Note. [1] ***, ** and * denote significance level of 1%, 5% and 10%, respectively. [2][a] and [b] denote patient satisfaction for the reform and for local low-level hospital, respectively.

satisfaction; capability, medical environment, and accessibility contribute to satisfaction with low-level hospitals. The reason is that, reform satisfaction reflects patients' views for the health service industry, cost reduction and improving convenience (eg, less waiting time) is applied to the whole industry and positively related to reform evaluation. While in terms of capability, medical environment, and the accessibility of the descending doctors from higher-level hospitals, these factors only relate to low-level hospitals, so they only affect patient satisfaction with low-level hospitals. For variables of corporate image, trust has positive relationship with satisfaction. However, the image of the descending high-level hospitals does not affect satisfaction with low-level hospitals. It indicates that, patients pay more attention to touchable factors when determining their satisfaction with low-level hospitals. The above results on reform effect indicate China's progress in promoting equal access to health resource and realizing its goal of people-centered integrated care introduced in 2017.[39]

Our analysis suggests that women have higher satisfaction with low-level hospitals, and this result indicates the gender difference on satisfaction,[40] and could be attributed to women's higher sensitivity to the less crowded medical environment, more service time and better communication in low-level hospitals, which is consistent with the results of Pan et al.[23] Those with higher education are less satisfied with the reform, indicating that their higher expectations contributed to lower ratings of the reform. Likewise, people with higher education have lower loyalty toward low-level hospitals, meaning that they have more options for care providers. Besides, older people also show lower loyalty to low-level hospitals, indicating their low sensitivity to time and high sensitivity to clinical results and money price. Insurance coverage has no impact on reform satisfaction but indicates negative impact on satisfaction with low-level hospitals. Theoretically, medical insurance can reduce the financial burden on consumers as they receive health services.[41] Since people with insurance coverage have a lower financial burden, a greater incentive is generated for them to compare between providers. Those with UBMI and commercial insurance are more likely to appeal to such incentives. However, the insurers of NRCMI are rural residents. This insurance requires patients to choose town- or county-level hospitals first. Therefore, the above incentive to compare and choose among providers does not exist. In contrast, all insured people have higher loyalty to low-level hospitals than uninsured people. There are 2 reasons for this finding. First, uninsured people need to pay for medical expenses themselves. Therefore, they must seek to reduce their medical expenses when making choices of care providers. At the same time, because of health service price regulation in China, the price difference is trivial among providers; however, the capability differs among hospitals of different levels. Therefore, uninsured patients are still incentivized to choose high-level hospitals first. Second, although the reform has led to a decline in medical costs, patients still need to bear out-of-pocket payment for medical expenses not covered by insurance. NRCMI insurance is financed at the county level. Approval is needed for patients to be transferred to high-level hospitals with the proportion of reimbursement being reduced. Although UBMI insurance can be used at different levels of urban hospitals, China has implemented a regressive insurance reimbursement policy in recent years. That is, the lower the hospital level is, the higher the rate of reimbursement will be. Therefore, patients with UBMI coverage are encouraged to choose low-level hospitals first, resulting in higher loyalty to low-level hospitals.

It is also found that, the larger the hospital is, the higher reform satisfaction would be. This result is contradicted to the conclusions of Dipl-Biomath et al[25] and McFarland et al.[42] The reason lies in the structural differences between China and developed countries, such as the United States and Germany. In developed countries, it is assumed that no significant differences exist among providers, and satisfaction with large hospitals is low because of deterioration in doctor communication, the medical environment, and timely responses as the expansion of size. In China, however, high-level hospitals usually have larger size, better capability and perceived quality than lower-level hospitals.[43] For the evaluation of satisfaction, the quality of core services dominates the quality of associated services like communication. Meanwhile, significant structural changes could be observed since the introduction of the descending resources reform. Before the reform, the congestion in high-level hospitals greatly increased the patients' waiting time but reduced the service time, thus leads to low patient satisfaction. After the reform, the congestion has been reduced. The capability improvement has led to an increase in resource utilization in secondary-level hospitals. Therefore, it is reasonable to see a positive relationship between hospital size and reform satisfaction. ANOVA shows that loyalty in primary hospitals is significantly lower than that in secondary/tertiary hospitals, but no significant difference exists between secondary and tertiary hospitals, giving evidence for the reform's effectiveness on promoting secondary hospital capability and regaining trust.

Finally, positive impact of patient satisfaction on loyalty is confirmed. Previous literature has found that quality of care affected patient satisfaction and in turn affected patient choices.[44] High service satisfaction positively impacts customer loyalty.[45] This study presents new evidence within the context of China's healthcare reform. It indicates that the reform has enabled low-level hospitals to strengthen their diagnosis and treatment capabilities, improve patient trust, and increase accessibility of the descending doctors from high-level hospitals. Meanwhile, promoting the accurate transmission of reform information to patients will also enhance patients' satisfaction with the reform and with low-level hospitals, thus motivating patients to choose low-level hospitals first.

From an international perspective, China's descending resources reform can be traced back to its medical assistance

to other developing countries initiated in the 1960s. It is rooted in China's public hospital system, and government's dominant role in health resource allocation. This enables Chinese government to correct the unbalanced allocation between urban and rural areas by exogenous forces and financial incentives. The descending resources reform is paving a new path to rebalance the medical market. Since such imbalances are prevalent in developing countries, China's experience can provide fresh ideas for countries where public hospitals dominate, and enrich their policy tools to balance health resource allocation from supply side of health market besides traditional financing mechanism and resource allocation formulae mainly from demand side.

However, we are also aware of the limitations of this study. First, this study is based on the sample data of Zhejiang province. Since this reform has been expanded to increasing number of provinces, patient satisfaction and treatment choices may vary in different regions. Future research should capture the possible heterogeneity through cross-provincial studies with larger samples, which will facilitate a better understanding of the policy effects and patient responses. Second, this study is based on cross-sectional data. However, to understand the dynamics of the reform's effects and patient responses over time, using panel data might be more appropriate. In addition, apart from the patients, other participants, such as care providers, healthcare workers, and medical students, are involved in the reform. Their responses should be included in future research to deepen our understanding for the reform.

Conclusion

China's descending resources reform is a new attempt to reallocate unbalanced resources in the supply side of healthcare market, which is different from the reforms that popularize in other countries with their focus on new financing mechanism and resource allocation formulae. China's reform affects patient satisfaction at the industry level and with the low-level hospitals, then reshaping patients' choices of care providers. Based on the extended ECSI model, this paper finds that the reform reduces the medical cost and increases the convenience at the industry level, and generates positive effects on strengthening the diagnosis and treatment capabilities and improving the medical environment of low-level hospitals, thus helping them to regain patients' trust. The accessibility of descending resources is also important. The above positive effects contribute to patients' satisfaction with the reform and low-level hospitals, which in turn prompts patients' loyalty to low-level hospitals. Meanwhile, promoting the accurate transmission of reform information to patients will also enhance patients' satisfaction with the reform and with low-level hospitals, thus motivating patients to choose low-level hospitals first. In future reform, it is necessary to strengthen the human capital spillover from high-level hospitals to low-level hospitals and to expand the coverage and accessibility of descending human capital to boost patients' trust, satisfaction, and loyalty. It's also needed to financially incentivize patients through differential pricing and insurance policies, to choose low-level hospitals first, thus finally resolving the structural congestion in China.

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ORCID iD

Zesheng Sun https://orcid.org/0000-0001-5705-8308

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