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Unconditional Cash Transfers in China: Who Benefits from the Rural Minimum Living Standard Guarantee (Dibao) Program?

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I. Introduction

Recent decades have seen a substantial expansion in the use of targeted cash transfer programs to address poverty in developing countries. Examples include the PROGRESA/Oportunidades program in Mexico and the Bantuan Langsung Tunai program in Indonesia. Such programs provide cash supplements to poor households. A common approach to identifying the poor is means testing, that is, eligibility is determined by comparing household income to a maximum income threshold. Targeted cash transfer programs have received considerable attention from policy makers and researchers, and the body of literature examining their design, implementation and impact continues to grow.

The focus of this study is a large targeted cash transfer program in China, the rural minimum living standard guarantee or "dibao" program. China's rural dibao program aims in principle to provide cash supplements to households with income below specified income thresholds. The transfers are unconditional, that is, beneficiaries are not required to fulfill any conditions in order to receive the transfer. The program is part of a multipronged effort since the late 1990s to rebuild rural social programs and address the changing structure of rural poverty (Lin and Wong 2012, World Bank 2009). Following substantial poverty reduction in the 1980s and 1990s, poverty in rural China became more dispersed geographically, and transitory poverty emerged as a new challenge (Lin and Wong 2012, World Bank 2009). These changes led China to shift away from its earlier "poor area" poverty alleviation program and adopt the dibao program, which targets households wherever they reside and, in principle, provides transfers based on either temporary or chronic income shortfalls.

Remarkably, the dibao program follows the idea of a Guaranteed Minimum Income (GMI), which is more common in richer country settings and mostly in Europe; perhaps this reflects China's aspirations to model its social assistance system on developed country experience. In this regard the dibao program is a major departure from social assistance approaches commonly found in other developing economies, which tend to favor public works programs (out of self-targeting considerations), conditional transfers (to boost human capital investments, e.g. Mexico's PROGRESA), and targeted distribution of food and non-food items (notably, India's Public Distribution System). In contrast, the GMI approach implies an entitlement[1] with all the attendant consequences for fiscal expenditures, targeting, coverage and generosity of benefits.

In line with the GMI approach, China's dibao program in principle aims to provide a transfer to all households with incomes below a specified threshold so as to close the gap between the recipient's income and the threshold, and thus guarantee a minimum income (or livelihood). In actual practice, however, dibao more closely resembles an unconditional cash transfer program with targeting, as found in developing countries. This deviation from the principle of GMI reflects the reality of the program's implementation, which is decentralized with local governments applying different eligibility criteria depending on locally identified "basic needs" and in light of local fiscal constraints. Moreover, in practice targeting relies on local assessment using available information about household living conditions and economic

[1] With the exception of public works, where anyone willing to work for a specified wage is guaranteed a job. Experience from India, however, shows that in practice a great deal of rationing undercuts the entitlement principle (Dutta et al., 2014).

activities relative to the local socioeconomic context, rather than on the application of a universal, objective and transparent welfare cutoff required for "guaranteeing" a minimum income or living standard. It is understandable that a cash transfer program in rural China cannot be implemented in the same way as in the European context, where sophisticated administrative and information systems linked to tax administration can track the incomes and wealth of a predominately urban population. Nevertheless, China may have set out the principles of the dibao program in anticipation of catch-up in formalization of the program and the advancement of management information systems, so that eventually dibao can evolve into a genuine GMI program.

China's rural dibao program began in the 1990s. Following the successes of the urban dibao program, local governments in rural areas began to experiment with similar social assistance programs adapted to their local conditions. The rural dibao experiments gradually expanded, and in 2007 the central government adopted the program nationwide. Coverage of the rural dibao program has since grown to reach 50 million individuals, comparable in size to large-scale cash transfer programs like India's National Rural Employment Guarantee and Brazil's Bolsa Familia program. Thus its potential impact on poverty within China, if not worldwide, is sizable.

Although a national program, implementation remains decentralized: eligibility thresholds, beneficiary selection, and transfer payment amounts are determined locally. The program's decentralized nature and considerable variation in thresholds and transfer amounts raise questions regarding the advantages and disadvantages of decentralization of public transfer programs, an issue discussed in Ravallion's (2009) analysis of China's urban dibao

program and more generally in the literature on public finance in developing countries (e.g., Gadenne and Singhal 2014).

China's urban dibao program has been the topic of several studies (e.g., Chen, Ravallion and Wang 2006; Gao, Garfinkel and Zhai 2009; Gao, Zhai and Garfinkel 2010; Gao, Zhai, Yang and Li 2014; Wang 2007; Ravallion 2008, 2009); however, the urban and rural programs are distinct, address different levels and types of poverty, and face somewhat different challenges. Despite its size and central position in China's current poverty reduction strategy, little is known about the rural dibao program's performance and poverty impact.

Our study of China's rural dibao program makes three contributions to the literature. First, we provide empirical estimates of the targeting and poverty reduction implications of China's rural dibao program. To our knowledge this is the first household-level empirical analysis of the dibao program in rural areas. Second, by varying the program's key design parameters — generosity and coverage rates — in simulations, our analysis yields insights about alternative policy recommendations to improve the program's anti-poverty performance. Third, the literature has not settled the question of whether eligibility criteria of potential beneficiaries in a large-scale income support program should be the responsibility of the central or local government. While uniform implementation of selection could in theory reduce poverty by virtue of improved "horizontal equity" (Ravallion 2009), our analysis shows that in practice the potential gains of centralizing the eligibility rule is conditional on the efficiency of targeting. As such, this study provides insights regarding the decentralized implementation of a large-scale income support scheme for the poor.

For our analysis we use nationwide household survey data from the China Household Income Project (CHIP) matched with county-level administrative data on the dibao program from the Ministry of Civil Affairs (MOCA). The data span the years 2007 through 2009, during which time the rural dibao program expanded to reach full nationwide coverage. Using these data, we outline major features of the program, estimate its poverty impact, and carry out targeting analysis.

We find that although the program provided substantial income benefits to beneficiaries, its impact on the overall level of poverty was limited. Targeting analysis reveals that the targeting errors were sizeable. We conduct conventional targeting analysis, in which program eligibility is defined by comparing household incomes as measured in the survey data to the local dibao thresholds. We also conduct propensity score targeting analysis, in which eligibility is defined in relation to the households' probabilities of selection for the dibao program, estimated as a function of observed characteristics such as household demographics, housing, employment and asset ownership. Both approaches reveal that the large majority of eligible households did not receive benefits, i.e., exclusionary targeting error was large. Both approaches also reveal that the large majority of beneficiaries did not satisfy the program's eligibility requirements, i.e., the inclusionary targeting error was large.

In a simulation exercise that mimics increases in the rural dibao budget since 2009, we analyze the potential benefits of increasing transfer amounts to existing beneficiaries versus expanding the program's coverage to additional households at existing transfer amounts. We find that expanding coverage has the potential to yield greater reductions in poverty than increasing the transfer amounts.

Variation in the dibao eligibility thresholds and transfer amounts is substantial and is correlated with local fiscal capacity. Poor counties tend to have lower dibao thresholds and transfer amounts than do rich counties. We simulate the impact of a more centralized approach with a uniform nationwide dibao threshold and a uniform nationwide transfer amount. The results indicate that such standardization measures, whether adopted separately or jointly, have the potential to reduce poverty. The gains from standardization, however, are likely to be minimal without improvements in the program's targeting performance.

The next section provides background on the rural dibao program and discusses relevant literature. Section III describes the data. Section IV shows patterns of dibao participation, thresholds, and transfers in the data. Section V examines whether dibao transfers bring recipient households above the dibao thresholds and out of poverty. Section VI analyzes the targeting effectiveness of the program using conventional targeting analysis. Section VII examines the characteristics of dibao and non-dibao households and presents the results of the propensity-score targeting analysis. Sections VIII and IX contain the policy simulations. A final section draws lessons and discusses implications.

II. Background on China's rural dibao program

Experiments with the rural dibao program began in the 1990s, mainly in more developed rural areas. By the early 2000s rural dibao programs were fairly widespread, but they primarily relied on local funding and, due to differences in local fiscal capacity, varied across counties in terms of the level of support and criteria for eligibility. In 2004 the central government called for the rural dibao program to expand and began to provide funding for the program in poor areas; by

the end of 2006 roughly 80 percent of the provinces and counties in China had adopted some form of rural dibao program (Ministry of Civil Affairs 2007, Xu and Zhang 2010).

In early 2007 the central government announced that the rural dibao program was to be implemented nationwide in all counties and with central subsidies (Xinhua 2007a, 2007b; Xu and Zhang 2010). Under this new national initiative, the program would become more standardized and would absorb or complement several pre-existing programs that had provided subsidies for poor households, such as the five-guarantee (*wubao*) program and the subsidy program for destitute households (*tekun jiuzhu*). Although central funding of the program increased, the program was to be co-funded by local governments based on their fiscal capacity, and the minimum income thresholds and subsidy amounts continued to be set locally at the county level in light of local fiscal capacity.

[Table 1 here]

Official statistics indicate that the rural dibao program grew quickly after 2006 (Table 1). In 2007, the first year of nationwide implementation, the rural dibao program provided transfers to 36 million rural individuals (4.9% of the rural population) and accounted for three-quarters of the rural recipients of social relief (National Bureau of Statistics Department of Social, Science and Technology Statistics 2008, p. 330; National Bureau of Statistics 2009, pp. 89, 939). By 2011 program participation had leveled off at about 50 million individuals, equivalent to 8% of the rural population. This is more than double the size of the urban dibao program (23 million) and outnumbers by a large margin the sum total of participants in all of

China's other rural poverty relief programs (17.9 million in 2010; does not include disaster relief) (Ministry of Civil Affairs 2011; National Bureau of Statistics 2011).

Spending on the program also grew. According to the official statistics shown in Table 1, in 2007 government spending on the rural dibao program was 11 billion yuan, with an average transfer amount of 466 yuan per recipient. In 2009 spending on the program was 36 billion yuan, with an average transfer of 816 yuan per recipient. The number of recipients leveled off after 2010-11, but program spending continued to expand, implying further increases in transfers per recipient. As of 2015, total spending reached 93 billion yuan, averaging 1,900 yuan per recipient.

Due to the diversity of China's rural economy and the difficulty of measuring income for rural households, the dibao program's implementation has differed among localities and evolved over time. Local variation and flexibility were explicitly built into the central government's dibao policy regulations (Poverty Alleviation Office of the State Council 2010). According to reports based on fieldwork (e.g., World Bank 2011), variation exists in the extent to which applications are open versus by invitation of local officials. In practice, village leaders often identify potential beneficiaries and invite them to apply. Village committees, which include village leaders and other community members, play a central role in identifying and screening potential beneficiaries. Members of village committees live in close proximity to and have local knowledge of potential beneficiary households. Applications or nominations for dibao benefits are submitted to the township government and forwarded to the county Department of Civil Affairs. Decisions are made by township and county officials, who review the documentary evidence submitted by households and villages, and who sometimes visit the

households to check on, or to collect additional, information. The names of applicants are, in principle, made public in the villages and are subject to community review and feedback.

National policy permits, and local officials in practice make use of, a range of information to evaluate eligibility. This might include information about household sources of income, assets, and housing conditions, as well as the presence of household members who are able or unable to work, or of illness or disability (Poverty Alleviation Office of the State Council 2010, World Bank 2011).

In principle the dibao program tops up the income of recipients to the level of the local dibao threshold. The amount of the dibao benefit, then, should depend on the level of the dibao threshold and the level of household per capita income. Table 1 shows the national average dibao threshold, which has increased over time. Dibao thresholds differ substantially among provinces and counties. Practices regarding how to determine the amount of the transfer also differ. In some areas local officials estimate the gap between the household's income and the local dibao threshold and decide on the transfer accordingly. Due to difficulties accurately measuring income in rural areas, however, most localities use other approaches. The 2007 national policy allowed local officials to classify households in tiers according to their apparent level of poverty and to set fixed benefit amounts associated with each tier. This tier-classification approach appears to have been widely used.

Several reports have noted that although such flexibility has advantages, it gives local officials and village leaders considerable discretionary power. The program does not appear to have well-functioning checks and balances, in part because of limited resources at the local level for administration of the program. These features of the program create the potential for

irregularities (World Bank 2011). In the Chinese-language media reports of rural dibao irregularities have been numerous, so much so that they have been classified into standard categories: giving dibao on the basis of connections or personal relationships (*guanxi bao, renqing bao*), cheating (*pian bao*), and mistakes (*cuo bao*).

Problems with the dibao program have gained the attention of China's central leadership and policy circles. In 2012 Guoqiang He, a member of the Politburo Standing Committee and Secretary of the Central Commission for Discipline Inspection, gave a speech about the problem of corruption in China that explicitly mentioned corruption in the dibao program using the phrase "a tide of unhealthy practices in urban and rural dibao (*chengxiang dibao zhongde buzheng zhi feng*)" (Zhu 2012). He outlined major reasons for these problems:

> "First, local village and township cadres don't do their jobs, they don't go out to the villages and meet with the people, don't really understand and grasp which are the households in difficulty; second, dibao work is not sufficiently transparent and open; and third, a few village and township cadres are selfish and looking out for their own benefit, and they give dibao benefits to relatives, friends, or even themselves."

The Ministry of Civil Affairs has openly acknowledged the existence of such irregularities and called for improvements in dibao work. Comments by the Minister of Civil Affairs regarding the findings of an internal review of the dibao program indicate that the review found cases of cheating, mistakes, and awards based on connections, but concluded that the overall incidence of such problems is relatively small. The internal review estimated that the rate of

incorrect/mistaken dibao benefits was 4% (Xinhuanet 2013). The basis of this estimate is not explained.

These sorts of reports reveal divergence between policies and implementation. Although the extent of such divergence is unknown, it raises questions about the rural dibao program's targeting and performance.

III. Data

For our analysis we use two types of data. First, we use CHIP rural household survey data for the years 2007, 2008 and 2009.[2] During the years covered by the dataset, the rural dibao program expanded rapidly nationwide. As of 2009, coverage was about 90% of the program's level at full implementation, which was attained after 2010 (Table 1). Second, we use administrative data published by the MOCA on rural dibao thresholds, transfers and expenditures. The MOCA data are available at the county level. We use the MOCA data for counties covered in the CHIP survey to create a matched dataset for the same years. The CHIP rural survey covers 82 counties, and for 77 we are able to match county-level information from MOCA.

The CHIP rural survey sample is a subset of the larger, nationwide rural household survey conducted by the National Bureau of Statistics (NBS). The CHIP sample covers nine provinces (Hebei, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing and Sichuan)

[2] The 2007-09 survey work was carried out jointly by the CHIP and the Rural Urban Migration in China (RUMiC) project.

that together account for nearly half of China's total population and span China's eastern, central and western regions. Table 2 summarizes the sample characteristics for each year.

[Table 2 here]

To obtain nationally representative estimates, we use two-level province x region sampling weights constructed using population statistics from China's annual 1% population sample surveys (NBS, various years). A detailed description of the CHIP dataset can be found in Li, Sato and Sicular (2013). Here we highlight key features relevant to our analysis.

The nine provinces in the 2007-09 CHIP sample exclude the Northeast and China's autonomous regions in the Northwest and Southwest. The autonomous regions contain relatively high concentrations of the poor, which may explain in part why the CHIP dataset has lower poverty rates than the full NBS sample. Based on the 2009 official poverty line and the full NBS national rural household survey data for 2009, China's poverty rate was 4.7%; using the same poverty threshold and (weighted) CHIP rural data, the poverty rate is 3.2%. Nevertheless, the mean values of key variables such as income are similar to those in the official data based on the much larger NBS rural household sample survey (Table 2; Li, Sato and Sicular 2013). Thus, with careful interpretation in light of sample coverage, the CHIP data provide a reasonable approximation of the situation in much of China.

The CHIP dataset contains detailed information on household incomes, consumption, composition and demographics, as well as community-level data gathered through a village survey. Some variables such as income were compiled and provided to CHIP by the NBS; other

variables were gathered using an independent survey questionnaire. The availability of rich information at the individual, household and village levels provides a unique resource for our analysis.

In the data and in our analyses, income is measured according to the NBS definition of net income for rural households, which includes wage earnings, net revenues from agriculture, net revenues from non-agricultural business, net property income, and transfers net of income taxes. Following the standard approach in the literature for China, income per capita is calculated as household income divided by the number of household members, without equivalence scale adjustments.

Dibao participation is self-reported by households. In our analyses we treat households that indicated participation in either the dibao or wubao programs as dibao households and their members as dibao participants, because the distinction between the two programs is not always clear at the local level and because during the time frame of our analysis the wubao program was to some extent being absorbed by the dibao program.

Table 2 shows the number of dibao (here and later including wubao) households and individuals in the CHIP datasets. The dibao numbers in the sample increase markedly over the three years, reflecting the expansion of the program during this time frame. Nevertheless, the numbers of dibao households and individuals in the sample are fairly small, adequate for analysis at the national level but with disaggregation the numbers quickly become too small for precise estimation.

The rural dibao participation rates in CHIP are lower than those implied by official data (Table 2).[3] To some extent this reflects the sample provinces. It is also possible that dibao households are under-sampled in the CHIP survey. Under-sampling of poor households — which are presumably more likely to be dibao recipients — is a known feature of the larger NBS household survey samples from which the CHIP samples are drawn. In addition, some dibao households may not report their dibao participation, for example, if they are not aware that the transfers they received were from the dibao program, or if they choose not to disclose their participation in the program. A third possibility is that the official numbers overstate true participation rates. Local-level governments in China are known to massage their statistics in order to appear to comply with policy targets or obscure local irregularities (Hvistendahl 2013).

In order to evaluate the dibao program's targeting performance, we need to estimate the "ex ante" or pre-transfer level of income that households would have had in the absence of the dibao transfers. In our calculations we estimate ex ante income as equal to reported or "ex post" income minus the amount of dibao transfers received by the household.

Such an "accounting method" (Bourguignon and Pereira Da Silva, 2003) assumes that receiving a dibao transfer does not change household behavior. Under some circumstances this assumption may not hold. For example, if program benefits are withdrawn when households increase their income, recipient households may face a disincentive to pursue income generating activities. Benefit withdrawal acts as a "tax" on the recipient that can potentially generate benefit dependency through reduced work

[3] Gao, Garfinkel and Zhai (2009) find that in the CHIP urban data (for 2002) the rate of dibao participation is also lower than the officially reported rate.

incentives. Such a behavioral reaction could lead to under-estimation of the ex-ante (pre-transfer) counterfactual income as calculated here. Conversely, if households use the transfers to invest in income-generating activities, then household income could increase by more than the amount of the transfer. Some studies of unconditional cash transfer programs in other countries have found evidence that, depending on the environment and program design, cash transfers can lead to household capital investments (Alderman and Yemstov 2012, Banerjee et al. 2015, Gertler et al. 2012, and Haushofer and Shapiro 2015). Such a behavioral reaction could lead to overstatement of ex-ante (pre-transfer) counterfactual income as calculated here.

Although we cannot rule out such behavioral responses to transfers in China's rural dibao program, available evidence suggests that they may be limited. Related work on China's urban dibao program by Ravallion and Chen (2015) finds that the urban dibao program is unlikely to elicit a strong negative incentive effect. While in principle the dibao program imposes a 100% marginal tax on participants, i.e., the benefit withdrawal rate (BWR) is 100%, they estimate that in reality the BWR is only around 12-14%, which is too small to reduce work incentives. In our case of rural dibao, the incentive effect is likely to be further muted, as the generosity of payment relative to incomes is lower than for urban dibao.

With respect to the investment effect, household use of unconditional cash transfers for investment depends on the design of the program. Haushofer and Shapiro (2016) find that larger, lumpy cash transfers are more likely to be spent on durables and investments, while smaller, monthly cash transfers on consumption. China's rural dibao program provides monthly transfers in relatively small amounts, and so falls in the latter category.

We provide some additional evidence on behavioral responses to China's dibao program in the Online Appendix. To investigate the relationship between income-related behavioral outcome variables and dibao program participation, we use a difference-in-differences (DD) estimator and panel time variation across the 2007, 2008 and 2009 years of the data. The results indicate no significant effects of the dibao program on a wide range of income-related behavioral outcome variables. Only one of the ten outcome variables—revenues from non-farm business activities—is affected in a statistically significant way. Although this one effect is sizeable, the result is highly sensitive to outlier values.[4]

Based on the results from the DD estimation as well as the other considerations mentioned above, we conclude that the effect of behavioral responses to the dibao program on overall income of participant households is unlikely to bias substantially our estimates of ex ante income.[5]

The CHIP dataset contains information on whether households are dibao recipients but not on the amounts of the dibao transfers received by the households.[6] Information about dibao transfers is, however, available at the village and county levels. The CHIP village-level data contain information for 2008 and 2009 but not 2007 on the number of dibao and wubao

[4] See the Online Appendix for a more detailed discussion.

[5] We consider the panel-based results in the Online Appendix to be only suggestive due to limited variation in dibao participation across the years, which hampers identification (see the Online Appendix for a more detailed discussion).

[6] The data contain information on the total transfer income received by the households, including both private and public transfers, but without any breakdown by source or type of transfer. We found no correlation between total transfers received by households and their dibao participation.

households within the village and on the average dibao transfer per recipient within the village. Also, MOCA publishes county-level data on rural dibao participation and expenditures, which we use to calculate county average dibao expenditures per recipient for all three years.[7]

We use the village and county average dibao expenditure amounts as proxies for household level dibao transfers and obtain two estimates of ex ante income for dibao households: one is equal to ex post household income per capita minus the village average dibao transfer, and the other ex post income per capita minus the county average dibao expenditure.[8,9]

[7] MOCA publishes county-level dibao data on a monthly basis. In our analyses for 2008 and 2009, we use year-end (December) values of the MOCA county-level dibao participation and expenditure levels to calculate monthly county average dibao expenditures per recipient, which we multiply by twelve. These estimates therefore capture the level of transfers per capita attained by the end of the calendar year. Since the MOCA county-level data are not available for 2007, for 2007 we use the January 2008 county-level data, multiplied by twelve. We compared the January versus December values of the MOCA dibao variables for later years (December 2008 versus January 2009, and December 2009 versus January 2010) and did not find systematic differences.

[8] Subtracting the average village transfer from ex post income is not ideal, as it may ignore within-village variation in transfer amounts. Given the data at hand, however, this assumption may be less problematic than it appears. In the sample, most villages contain no more than one dibao household: only about 3 percent, 4 percent and 5 percent of villages had more than one dibao household in 2007, 2008 and 2009, respectively. In 2009, for example, 80 percent of the villages had zero, 14.4 percent had one, and only 5 percent had more than one dibao household. Thus the potential for within-village variation in the data is minimal.

[9] In the few cases of missing village-level (county-level) data we use county-level (village-level) information to impute missing values.

IV. Patterns of dibao participation, thresholds and transfers

Consistent with the official data in Table 1, our data show substantial expansion of the dibao program since 2007 in terms of both numbers of beneficiaries and transfer amounts (Tables 2 and 3).

[Table 3 here]

Calculated using the CHIP data, the rate of participation in the rural dibao program increased from 1.9% in 2007 to 3.0% in 2009 (Table 2). Dibao participation rates in the CHIP data varied substantially among regions, for example, in 2009 from less than 1% in Hebei and Zhejiang provinces to 5-6% in Guangdong and Chongqing. Similar variation is evident in the official data. Such variation reflects differences across locations in dibao thresholds, financing and implementation, as well as in household incomes and thus eligibility.

The mean dibao threshold, calculated using MOCA county-level data for all provinces, increased from 1,064 yuan per capita in 2007 to 1,428 yuan per capita in 2009; changes were similar for the nine sample provinces. The mean dibao transfer per capita also increased. Dibao thresholds were, on average, higher than, and dibao transfers lower than, China's official poverty lines at the time (785 yuan in 2007, 1,067 yuan in 2008, and 1,196 yuan in 2009).

The MOCA county-level data show substantial variation in dibao eligibility thresholds. Figure 1 is a graph of the distribution of county dibao thresholds for the CHIP sample counties in each of the three sample years. In 2007 and 2008 the county dibao thresholds ranged from less than 500 yuan per capita per year to more than 3,000 yuan. In 2009 the lowest thresholds had risen above 500 yuan, and the highest to more than 4,000 yuan.

[Figure 1 here]

Figures 2a and 2b show the distributions of dibao transfers in the CHIP sample counties for 2008 and 2009. The distributions based on the county-level averages from MOCA data and on the village-level averages from CHIP are similar, although variation is wider at the village level (because averaging at the county level eliminates variation within counties). As is the case for the thresholds, variation is substantial. In 2009, for example, county average dibao transfers ranged from less than 500 to more than 3,000 yuan per capita.

[Figure 2a and Figure 2b here]

Is dibao participation higher for lower income households? Using the CHIP data, we calculate dibao participation rates by deciles of ex ante income (Figure 3). In general, dibao participation rates are higher for poorer income groups. In all three years the participation rates are highest for individuals in the poorest decile of the income distribution. Dibao participation drops sharply for the second poorest decile, and thereafter tends to decline further as one moves to higher income groups. In all years, however, less than 10% of individuals in the poorest decile are dibao participants. Moreover, in all years dibao participation is evident in all income deciles, including the very richest.

[Figure 3 here]

With expansion of the dibao program over time, the pattern of participation has shifted more towards poorer income groups. As shown in Figure 3, between 2007 and 2009 participation rates increased for most income groups, with relatively large increases for the bottom deciles. Participation rates, however, also rose for the middle deciles. For the richest four deciles, participation rates remained below 2% in all three years. Figure 3 reveals that even though poorer groups are more likely to participate in the dibao program, participation by middle-income and richer deciles is nontrivial.

V. Dibao transfers, incomes and poverty

Did dibao transfers raise poor households' incomes above the dibao thresholds? In other words, did the dibao program in fact provide a minimum income guarantee? Some relevant information is shown in Table 4, which gives the percentages of individuals with incomes below their local dibao thresholds in each of the three years. The first three rows classify individuals using ex post incomes; the second three rows using ex ante incomes calculated using village average transfers; and the bottom three rows using ex ante incomes calculated using county average transfers.

[Table 4 here]

As shown in the first column of Table 4, the percentage of individuals whose ex post income was below the dibao thresholds increased over time, from 1.9% in 2007 to 2.2% in 2008

and further to 3.7% in 2009. This increase is somewhat surprising given the dramatic expansion of dibao participation and transfers during these years, but dibao thresholds also increased during these years. Examination of ex ante incomes reveals that the share of individuals who were eligible for the program also grew: from 2007 to 2009 the share of individuals in the CHIP sample with ex ante incomes (calculated using county average transfers) below the local dibao thresholds rose from 1.9% to 3.9%.

If we confine our attention to dibao recipients who started out with ex ante incomes below their local dibao thresholds, the data indicate that the program was reasonably successful in providing an income guarantee. In all three years the percentage of dibao recipients with ex ante incomes below the dibao thresholds exceeded the percentage with ex post incomes below the thresholds (last column, Table 4). For example, in 2009 11 to 14% of dibao recipients had ex ante income below the dibao thresholds, and only 5.6% had ex post income below the dibao thresholds, which implies that the dibao transfers raised more than half of dibao recipients who started out below the local dibao threshold above the threshold.

These numbers, however, ignore non-recipients. More than nine out of ten individuals with income below their local thresholds did not receive dibao transfers. For these individuals, the dibao program did not provide a minimum income guarantee. The low proportion of eligible individuals receiving dibao reflects a substantial exclusionary error in targeting, which we discuss in the next section.

Did the dibao program reduce rural poverty? We answer this question by comparing poverty incidence and the poverty gap calculated using ex ante versus ex post incomes. Table 5

reports estimates of poverty rates (poverty incidence) calculated using three absolute poverty lines.[10]

[Table 5 here]

In all cases poverty incidence was higher for ex ante incomes than for ex post incomes. This is consistent with a poverty-reducing impact of the dibao program. The magnitude of this impact was, however, small: the difference in ex ante versus ex post poverty incidence is less than half a percentage point.

Table 6 presents the estimates of the poverty gap by year. The poverty gap measures the total amount of money that would be required to bring the incomes of all the poor up to the poverty line. It is calculated by aggregating the weighted differences between the poverty line and per capita income for all individuals with incomes below the poverty line in the sample. As expected, the poverty gap calculated using ex ante incomes is larger than that calculated using ex post incomes. Again, however, the difference is small. In 2007 and 2008 the ex ante poverty gap was only 2-3% larger than the ex post poverty gap, and in 2009 it was only 6.5% larger.

[Table 6 here]

[10] For estimates of absolute poverty, we use China's official poverty line as of 2011 (adjusted back to 2007, 2008 and 2009 using the national rural consumer price index). We also use the $1.25 and $2 per person per day international poverty thresholds based on purchasing power parity (PPP) income. See notes to Table 5 and Golan, Sicular and Umapathi (2014) for further details.

Table 6 also summarizes dibao expenditures as a percentage of the poverty gap. According to the official dibao data, in 2007 total dibao expenditures were equivalent to 18% of the ex ante poverty gap; by 2009 total dibao expenditures had risen to 61% of the ex ante poverty gap. The reduction in the poverty gap per yuan of dibao expenditures was therefore modest. In 2007 each yuan of dibao expenditures was associated with a reduction in the poverty gap of only 0.13 yuan. In 2009 each yuan of dibao expenditures was associated with a reduction in the poverty gap of only 0.10 yuan.

We have calculated total dibao expenditures implied by the CHIP data (equal to the weighted sum of county level transfers times the number of dibao recipients within each county, see note to Table 6).[11] By this calculation, total dibao expenditures were lower than the official numbers; for example, in 2009 they amounted to only 36% of the official total. Even using these lower estimates of total dibao expenditures, the poverty impact of the dibao program remains modest. In 2009, for example, dibao expenditures implied by the CHIP data were equivalent to 26% of the ex ante poverty gap. The poverty gap calculated using ex post incomes that include dibao transfers, however, was only 6.5% lower than that calculated using ex ante incomes. Each yuan of dibao expenditures was associated with a reduction in the poverty gap of only 0.24 yuan. Such discrepancies between dibao expenditures and poverty reduction suggest leakages in targeting.

[11] For dibao recipients who live in counties for which MOCA county-level transfer data are missing, we use the village average transfers from CHIP.

VI. Conventional analysis of dibao targeting

Poverty programs do not always reach the targeted populations, and individuals outside the targeted population often receive benefits. Consequently, poverty programs are characterized by targeting error. Inclusionary targeting error refers to cases where program benefits go to individuals who are not eligible for the program. Exclusionary targeting error refers to cases where eligible individuals do not receive program benefits.

Following conventional methods in the literature, we use the CHIP data to calculate inclusionary and exclusionary targeting errors for China's rural dibao program. The dibao program's stated goal is to assist households with incomes below the dibao thresholds, so inclusionary targeting error is a relevant criterion for evaluation of the program. The dibao program does not claim to reach all households with incomes below the dibao thresholds, so exclusionary error does not measure the success of the program in meeting its own objectives. Nevertheless, analysis of the program's exclusionary targeting error is informative.

Table 7 contains our estimates of the rural dibao program's inclusionary and exclusionary targeting errors. Program eligibility is defined by whether ex ante income is below the local dibao threshold. Targeting errors have declined over the three years. For example, estimates based on the county average dibao expenditures show that inclusionary error declined from 94% in 2007 to 86% in 2009. In other words, the share of dibao recipients with income above the local eligibility threshold declined by 8 percentage points. The exclusionary error also declined, from 94% to 89%. In other words, the share of the rural population eligible for dibao but not receiving benefits declined by 5 percentage points. Despite these

improvements, our estimates indicate that the vast majority of beneficiaries were not eligible, and the vast majority of eligible individuals did not benefit from the rural dibao program.

[Table 7 here]

By comparison, for China's urban dibao program Chen, Ravallion and Wang (2006) report an inclusionary targeting error of 43% and an exclusionary targeting error of 71%. Although based on data for earlier years, their estimates suggest that the targeting performance of China's urban dibao program is markedly better than that of the rural dibao program. Weaker performance of the rural dibao program is not surprising given the more limited human and fiscal resources for program administration in rural China, the greater geographic dispersion of the rural poor, and the inherent difficulty of measuring rural incomes.

How well did the rural dibao program target poor households? To answer this question, we evaluate the targeting performance of the rural dibao program relative to the official poverty line. Table 8 shows the inclusionary and exclusionary errors calculated in relation to the official poverty line. Program eligibility is here defined by whether ex ante income is below the poverty line. By this criterion, inclusionary error is between 64 and 75%, depending on the estimate and year. That is, between 64 and 75% of dibao recipients were not poor. The exclusionary error is between 92 and 95%, indicating that the overwhelming majority of the poor did not benefit from the dibao program.

[Table 8 here]

VII. Correlates of dibao participation and propensity score analysis of dibao targeting

The conventional analysis of dibao targeting implicitly assumes that the selection of program beneficiaries is based on household incomes as measured by the survey data. As discussed by Chen, Ravallion and Wang (2006), such an assumption may not be correct. Local officials who implement the dibao program do not have access to the survey data. In practice, local officials select beneficiaries based on some observable correlates of income. China's national rural dibao policies in fact endorse such practices, and local regulations explicitly mention alternative criteria for identifying recipients.

In view of these considerations, we employ a propensity score targeting analysis that mimics the decision making practices of local officials. Our approach is a variation of the propensity score approach used by Chen, Ravallion and Wang (2006) to analyze China's urban dibao program. In their analysis they assume that local officials select beneficiaries with reference to a latent income variable that is correlated with ex ante income as measured in the survey data, as well as with other observed characteristics plus an error term. Targeting analysis is then carried out based on the predicted probability of being selected for the dibao program given latent household income plus observed characteristics (Ravallion 2008). We follow this approach, except that we exclude the income variable from our estimation equation

so that our analysis reflects more closely the decisions of local rural officials based on the information available to them.[12]

The first step of propensity score targeting analysis is to estimate a probit regression with dibao participation as the dependent variable and relevant observed household characteristics as the independent variables.[13] The observed characteristics are chosen to reflect local implementation practices and include variables related to household demographic composition, health of household members, household economic activity, and human and physical assets. We do not include household income as an independent variable, but because local officials are likely to be able to evaluate the importance of wage and business income for the households, we include the shares of income from wage employment and household non-farm business as independent variables. Controls for certain community characteristics and for province of residence capture location-specific effects. We carry out the probit analysis using the household as the unit of analysis.

The second step is to use the results of the probit model to predict a conditional probability of program assignment (the propensity score). The estimated coefficients from the

[12] For comparison, we also conducted the propensity score analysis including ex ante income in the regressions. The estimated coefficients were similar to those reported here. The targeting errors were slightly (1 to 4 percentage points) smaller than those reported here, but overall similar.

[13] To check robustness, we also estimated the regressions using logit and linear probability models. The results are reported in Appendix Table A4. Because the predicted probabilities in the linear probability model are not bound between 0 and 1 and we use the estimates for our targeting analysis, it is not our preferred specification. Given the similar results of the probit and logit models and the better fit of the probit, we have chosen to report the findings based on the probit model.

probit regression correspond to the implicit weights assigned by program administrators to observed characteristics when deciding on beneficiaries. Third, a cutoff number of beneficiaries is determined based on the observed coverage rate. Beneficiaries are then selected by counting off households ranked from highest to lowest propensity score until the cutoff is reached. These selected households are used to calculate the targeting errors.

Tables A1, A2 and A3 in the Appendix contain descriptive statistics for variables in the probit regressions shown separately for dibao and non-dibao households. On average, dibao households differ from non-dibao households. Dibao households are smaller and contain markedly higher shares of members who are elderly, in bad health, or with a disability, than non-dibao households. In 2007, for example, 20% of dibao households contained a family member over the age of 60, 41% contained a member in bad health, and 35% contained a member with a disability, as compared to 10%, 14% and 12%, respectively, for non-dibao households. Differences also exist in ownership of physical assets. Housing conditions, as measured by whether housing is multi-storey and the presence of piped water and flush toilets, are poorer for dibao households. Ownership of durable goods such as household appliances and motorized vehicles is lower.

The communities in which dibao households live are somewhat different from those of non-dibao households. In general, a higher share of dibao households live in villages that experienced a natural disaster, do not have a paved road, and are distant from the nearest township government.

The probit regressions reveal that many of these characteristics are statistically significant predictors of dibao status.

[Table 9 here]

Table 9 reports the estimated marginal effects of the probit regressions. In all years the estimates show that the probability of receiving dibao benefits has a significant association with observable factors that are correlated with household incomes. For example, having a disabled household member increases the probability of receiving dibao by 1.8 to 4.0 percentage points. Other characteristics that are consistently significant in most years and specifications are: household size (negative), bad health (positive), the share of wages in income (negative) and the share of income from non-agricultural business (negative). Variables related to assets such the absence of a major appliance (positive) and ownership of motorized transport (negative) are also significant.

The estimated coefficients change somewhat across the years. Notably, more variables are significant in 2009 than in the earlier two years. For example, the share of elderly becomes significant (positive) in 2009, indicating that selection criteria may have changed to emphasize households with elderly family members. The presence of a migrant worker (positive), marriages (negative), deaths (positive), and cultivated land area (negative) also become significant in 2009. These changes may reflect the refinement of, or adaptation in, the criteria used by local officials to decide on eligibility for the program, or perhaps more coefficients become significant because of smaller standard errors due to the larger number of dibao households in the 2009 sample than in 2007 and 2008. It is also possible that the expansion of

the dibao program during this time period may have allowed the widening of eligibility criteria to include more characteristics.

Using the estimated coefficients from the probit regressions, we calculate the probabilities of selection for the dibao program, determine cutoffs between eligible and non-eligible households, and calculate the propensity score targeting errors. The results give a somewhat more positive picture of the program's performance than the conventional targeting analysis (Table 10).

[Table 10 here]

Dibao coverage among households classified as eligible according to propensity scores is higher — and thus exclusionary targeting error is lower — than that implied by conventional targeting analysis (Tables 7 and 10). The exclusionary targeting error in 2007 is now 84.6%, declining slightly to 84.4% in 2008 and 83.5% in 2009. This compares to the conventional estimates close to or exceeding 90% in all three years. Stated differently, according to the propensity score targeting analysis, 14 to 15% of eligible households received dibao benefits, as compared only 6% in 2007, 7% in 2008, and 8 to 11% in 2009 by the conventional analysis.

Similarly, the propensity score analysis gives inclusionary targeting error that is lower than for conventional targeting analysis. Based on the propensity score approach, 85% of dibao recipients were not eligible in 2007, as compared to 94% by the conventional analysis; in 2008

and 2009 the propensity score inclusionary errors are 84% and 83%, as compared to 92% and 86%, respectively, for the conventional approach (Tables 7 and 10). Thus dibao leakage to households classified as ineligible using the propensity score as the selection criterion is substantially lower than that based on the survey income data.

All in all, the propensity score targeting analysis yields smaller targeting errors than conventional targeting analysis. These results are consistent with a situation in which local officials rely on observable household characteristics to determine dibao eligibility. Nevertheless, the targeting errors remain high. The vast majority of eligible households do not receive dibao benefits, and the vast majority of households that receive dibao benefits are not eligible.

VIII. Policy simulations: Expand coverage versus increase transfer amounts

The rural dibao program has expanded substantially since 2009: in 2015 the total rural dibao budget was 2.57 times that in 2009 (Table 1). Most of this expansion was directed to increasing transfer amounts rather than widening coverage. Between 2009 and 2015 the average dibao transfer per recipient more than doubled, while the number of recipients increased only slightly. The observed expansion of the program could effectively reduce poverty, but only if most dibao beneficiaries are poor and if the transfer amounts in 2009 were insufficient to bring them above the poverty line. Our earlier findings, however, suggest that these conditions did not hold.

Here we evaluate the poverty impact of such a program expansion using the CHIP data. Specifically, we carry out a simulation in which we increase transfer amounts to existing

recipients, with no expansion of coverage. For comparison, we also carry out a simulation of the alternative option of expanding program coverage without increasing transfer amounts. For both simulations we calculate the resulting poverty levels. Both simulations use the same overall dibao budget, so as to permit a comparison of the poverty impact of the two alternative policies.

In the simulations we retain local variation in dibao eligibility thresholds and dibao transfer amounts, as observed in the 2009 CHIP data. We set local transfer amounts equal to the average transfer in the household's village of residence, as reported in the CHIP village-level survey.[14] To calculate poverty levels, we use the (2011) official poverty line.

The impact of these alternative policy options is evaluated in comparison to an "observed" baseline case that reflects the incomes and dibao participation patterns observed in the 2009 CHIP data. "Observed" baseline poverty levels are the levels of poverty implied by ex post incomes in the data. The dibao budget for the "observed" baseline is equal to the sum total of local dibao transfer amounts for all dibao recipients (weighted) in the data.[15] As shown in the first row of Table 11, in the "observed" baseline the poverty rate is 11.2% and the poverty gap index is 3.9%.

[Table 11 here]

[14] In cases where data for the village average dibao transfer are missing, we use the county average transfer.

[15] Note that the dibao budget in the baseline does not equal the official number reported by MOCA, reflecting the lower dibao participation rate in the CHIP sample than in the official statistics (see Table 6 and related text). Also, the dibao budget in the baseline differs slightly from CHIP total dibao expenditures in Table 6, which are calculated using county average dibao expenditures. Here we use village average dibao transfers.

The simulations require a decision about how much to expand the program budget. For simplicity, we choose a target budget equal to the amount of money that would be spent if the program were expanded to cover all individuals in 2009 who were eligible but were not included in the program. In other words, we calculate the cost of providing local dibao transfers to all non-recipients whose per capita incomes were below the local dibao thresholds, and we add this cost to the baseline dibao budget. This target budget is sufficient to maintain the existing program plus eliminate all exclusionary targeting error. It yields a target budget equal to 2.54 times the baseline budget, which is very similar to the actual expansion in the dibao budget (2.57 times) after 2009.

The results of these policy simulations are shown in Table 11. To what extent would increasing the transfer amounts reduce poverty? Simulation (a) gives the results. The poverty impact is modest: relative to the baseline, poverty reduction is at best only 3%.

Would expanding coverage be more effective? For the simulation with expanded coverage, we present two scenarios. One scenario (simulation b) assumes perfect targeting: all added dibao recipients have income below the dibao eligibility threshold in their locations of residence.[16] The second scenario (simulation c) assumes no targeting: additional recipients are selected randomly from among all non-recipients, so the added recipients include individuals whose incomes are above the dibao thresholds. These two simulations can be interpreted as optimistic and pessimistic targeting scenarios for the expansion of coverage.

[16] By construction, the target budget in the simulation is just sufficient to ensure that all eligible individuals receive dibao transfers.

The results reveal that expanding coverage has the potential to substantially reduce poverty relative to the "observed" baseline; however, much depends on how the additional recipients are selected. If we assume optimistically that the new recipients are selected using perfect targeting (b), the expansion reduces the poverty headcount by more than 5%, the poverty gap by 24%, and the squared poverty gap by 17%. If we assume random selection (c), the expansion reduces the poverty measures by 3% or less. The poverty impact of this second scenario is no greater than that of increasing the transfer amounts (simulation a).

We conclude that even if targeting is imperfect, expanding coverage dominates increasing transfers. So long as the dibao program does a better job than random selection, expanding coverage to more households should yield greater poverty reduction than increasing transfer amounts to existing recipients. Our simulations therefore indicate that the large increase in dibao expenditures observed after 2009 would have had greater poverty impact if the funds had been used mainly to expand coverage, rather than increase transfers.

IX. Policy simulations: Adopting a uniform national dibao transfer and threshold

China's rural dibao program is run in a decentralized fashion, with eligibility thresholds and transfer amounts set locally and varying substantially across localities. Studies have found that richer areas with greater fiscal capacity tend to have more generous dibao programs (Ravallion 2009). These features of the program are thought to reduce its effectiveness. Households above the official poverty line in richer areas may be selected for dibao, while households below the poverty line in poorer areas may be left out. Furthermore, households in richer

areas receive larger dibao transfers than those in poorer areas. For these reasons, several studies have recommended that China adopt a nationally uniform threshold and equalize the transfer amounts (World Bank 2009).

We investigate the potential benefits of adopting a uniform transfer and uniform threshold with a set of simulations. First we examine the poverty impact of adopting a uniform transfer nationwide. We assume that this uniform transfer goes to the existing dibao households, i.e., targeting is unchanged. For purposes of comparison, we also examine the impact of a uniform transfer under the assumption of perfect targeting. For the perfect targeting case, we construct a baseline scenario in which all households with incomes below the observed local dibao thresholds are included in the program and receive the observed local transfers. We then replace the local transfers with a uniform transfer and compare the resulting poverty levels.

Second, we examine the effect of a uniform national eligibility threshold. For the threshold we use the official (2011) poverty line.[17] We simulate the consequences of the uniform threshold policy for poverty under alternative targeting scenarios, with reference to a baseline. Third, we combine the uniform transfer together with the uniform threshold. Again, we simulate the combined policies under alternative targeting scenarios, with reference to a baseline. This series of simulations allows us to compare the impacts of equalizing transfers, versus equalizing thresholds, versus a combination of the two.

[17] At 2,098 yuan, the official poverty line is higher than the average dibao threshold; however, in some counties the threshold exceeds this level. See Figure 1 and Table 3.

A. Uniform transfer

Our first simulation replaces the locally diverse transfers in the "observed" baseline with a uniform transfer. We set the uniform transfer equal to the average observed transfer, which was 666 yuan. The dibao thresholds, recipients, and budget remain identical to the "observed" baseline case. The outcome of this policy is shown in Table 12 as simulation (d). Compared to the "observed" baseline, the poverty headcount, poverty gap and poverty gap squared change little. These results suggest that, in the absence of any other policy changes, adopting a uniform national transfer would yield minimal poverty gains.

[Table 12 here]

One reason why this simulation has such a small impact on poverty is that the dibao transfers continue to go to "observed" dibao recipients, most of whom are above the poverty line. As noted earlier, the overwhelming majority of dibao recipients had ex ante incomes above the poverty line.

Would adopting a uniform transfer reduce poverty if targeting were better? To answer this question, we analyze whether, under perfect targeting, adopting a uniform transfer would reduce poverty levels. We begin by constructing a new baseline case with perfect targeting. For the "perfect targeting" baseline we assume that individuals receive dibao transfers if and only if their ex ante incomes are below their local dibao thresholds. In other words, all individuals who are dibao eligible, and no one else, receive transfers. Note that this assumption expands the number of program beneficiaries compared to the "observed" baseline.

In the "perfect targeting" baseline the transfers remain at the observed local transfer amounts. The dibao budget implied by this "perfect targeting" baseline is 23.7 billion yuan, which, due to the expanded number of beneficiaries, is larger than the dibao budget in the "observed" baseline. Poverty outcomes for the "perfect targeting" baseline are shown in the third row of Table 12.

We can now examine the effect of adopting a uniform transfer under perfect targeting. We assume that the uniform transfer is equal to the average transfer (887 yuan) in the "perfect targeting" baseline. The results are shown in the last line of Table 12 (simulation e). Under the scenario of perfect targeting, the impact of adopting a uniform transfer is noticeable. Compared to the "perfect targeting" baseline, a uniform transfer reduces all three poverty measures, especially the poverty gap, which declines by 12%.

These simulations suggest that the rural dibao program could benefit from the adoption of a uniform transfer. The benefits, however, are highly sensitive to targeting performance. Under the existing, large targeting errors, adopting a uniform transfer would have little impact on poverty.

B. Uniform threshold

What about adopting a uniform threshold? For the uniform threshold we use the official (2011) poverty line. This poverty line is higher on average than the local dibao thresholds in 2009, and so the number of poor exceeds the number of households with incomes below the observed dibao thresholds. Consequently, the dibao budget in the "perfect targeting" baseline

case is insufficient to cover all individuals who are eligible according to the poverty line threshold.

We must therefore make some assumption about how to select dibao recipients from among the poor. We use two alternative assumptions. The first is that recipients are selected based on distance from the poverty line, starting with the poorest (simulation f). The second is that recipients are selected randomly from among the poor (simulation g). Both methods select only recipients who are poor; however, selection in simulation (f) is based on depth of poverty and in simulation (g) ignores depth of poverty.

[Table 13 here]

We compare these simulations to the "perfect targeting" baseline. The "perfect targeting" baseline and these two simulations have the same number of dibao recipients, and the dibao transfers are equal to the local, varying transfer amounts. Comparing the poverty outcomes of simulations (f) and (g) to the "perfect targeting" baseline tells us whether, in a world of perfect targeting, replacing local thresholds with a uniform threshold would reduce poverty.

As reported in Table 13, simulation (f) reduces the poverty gap and squared poverty gap compared to the baseline, but the poverty headcount increases. Simulation (g) reduces the poverty headcount and poverty gap, but the squared poverty gap increases. This difference in outcomes is not surprising, because the dibao recipients in (f) are on average in deeper poverty than the recipients in (g). We conclude that, under the assumption of perfect targeting,

adopting a uniform national eligibility threshold has the potential to reduce poverty substantially compared to retaining local dibao thresholds, although the nature of the poverty impact will depend on how recipients are selected among the poor.

C. Uniform transfer and uniform threshold

Finally, what would be the result of adopting both a uniform transfer amount and a uniform threshold? Simulations (h) and (i) in Table 13 explore this policy option. In both these simulations the uniform transfer is set equal to the average transfer in the "perfect targeting" baseline (887 yuan). Simulation (h) selects recipients based on depth of poverty, while simulation (i) selects recipients randomly among the poor.

Both these simulations yield reductions in some, but not all, of the poverty measures. If dibao recipients are selected based on depth of poverty (simulation h), reductions in the poverty gap and squared poverty gap are substantial. By these measures, adopting both a uniform transfer and a uniform threshold is superior to adopting only a uniform transfer (simulation e). The poverty headcount, however, is higher than in both simulation (e) and the "perfect targeting" baseline.

If dibao recipients are selected randomly among the poor (simulation i), then reductions occur in the poverty headcount and poverty gap. By these two poverty measures, adopting both a uniform transfer and a uniform threshold is superior to adopting only a uniform transfer. The squared poverty gap, however, is higher.

Overall, the simulations in Table 13 indicate that a uniform threshold with or without a uniform transfer has the potential to increase the dibao program's effectiveness, and so these simulations provide some support for a more centralized, standardized approach. These

simulations, however, assume perfect targeting. Outcomes in the real world, which is characterized by substantial targeting error, could be quite different. Simulation (d), for example, demonstrates that in the presence of targeting error at observed levels, the impact of a uniform transfer policy would be minimal.

X. Conclusions

China's rural dibao program, which was adopted nationwide starting in 2007, is now among the largest unconditional cash transfer schemes in the world. The program's implementation and expansion in recent years have coincided with reductions in rural poverty in China. This raises the question of whether, or to what extent, the program has contributed to poverty reduction.

Using annual household survey data from the CHIP matched with administrative data from MOCA for 2007-2009, we examine the relationship between China's rural dibao program and rural poverty. We find that during these years the rural dibao program provided sufficient income to poor beneficiaries, but the impact of the program on the overall poverty rate was small. Although total dibao expenditures are fairly large relative to the poverty gap, the program did not substantially reduce poverty whether measured in terms of the headcount or poverty gap.

Conventional targeting analysis reveals large inclusionary and exclusionary targeting errors. Propensity score analysis of targeting reduces the targeting errors, which suggests that program recipients were selected on the basis of observable correlates of income. Nevertheless, the targeting errors remain quite large. These findings are subject to some

limitations of our data, and we note that possible understatement of dibao participation in the data could cause bias the results of our targeting analysis downward.

Nevertheless, our estimates of targeting errors are consistent with and provide empirical support for recent efforts in China to improve rural dibao implementation. In 2013, for example, the Ministry of Civil Affairs announced several policy directives for the rural dibao program, including (1) allowing households to apply for dibao benefits directly to the county Department of Civil Affairs rather than having to go through the village and township levels, (2) requiring that county-level officials visit and check at least 30% of applications, (3) instituting a filing and auditing system for close relatives of local officials and village leaders involved in dibao implementation, (4) establishing and improving systems for community feedback, and (5) establishing a systematic mechanism for checking information on dibao applications against information in other departments, for example, vehicle registration data and savings account information (Xinhuanet 2013). These new policies are aimed at reducing irregularities and improving program targeting.

Our analysis also indicates that, aside from targeting issues, a central reason for the program's modest poverty impact in 2007-09 was that the proportion of the population covered by the program was relatively small. After 2009 government spending on the rural dibao program expanded rapidly. Most of the budget increase has been used to increase transfer amounts. The number of recipients has changed relatively little. Using simulations, we investigate whether expanding the dibao program would increase its impact on poverty. Our findings indicate that expanding the program could be beneficial if the expansion mainly takes

the form of expanding coverage rather than increasing transfer amounts per recipient. This, however, has not been the case since 2009.

We also explore whether adopting a uniform transfer and uniform threshold would improve the program's poverty impact. We find that standardization of transfers and thresholds has the potential to substantially reduce poverty, but the extent to which that potential is realized depends critically on targeting.

Our simulations yield several broad lessons for cash transfer programs. First, they highlight potential tradeoffs between program coverage and the generosity of transfers per recipient. Program coverage and generosity per recipient can have different impacts on poverty, and those impacts depend on targeting performance. Our simulations illustrate how the impacts of coverage versus generosity change under alternative targeting scenarios. We treat targeting as exogenous, but we acknowledge that targeting could be influenced by the parameters of the program and thus be endogenous. For example, small transfers may promote self-selection by poorer households into the program, thus improving targeting as evidenced by the Brazilian Bolsa Familia program (Bastagli 2008). This sort of interaction between program parameters and targeting performance strengthens the case for expanding coverage versus increasing transfer amounts.

Second, the simulations yield some insights about local variation versus uniformity of cash transfer programs. The argument for standardization in China is that under the decentralized fiscal system, local budgets for transfer programs are positively correlated with local income. Our simulations suggest that in the presence of weak targeting, the gains from standardization may in practice be limited. Moreover, based on our simulations, we speculate

that adopting a uniform eligibility criterion may be more effective in reducing poverty than adopting a uniform transfer because a uniform threshold would tend to increase the proportion of recipients located in poorer locations. Standardization of thresholds (or, for that matter, transfers) would, however, require fiscal subsidies to poorer locations in order to support their increased program costs.

There is still a dearth of knowledge about the rural dibao program's impacts on a wider set of welfare outcomes related to long term poverty, including impacts on human capital investments and labor supply. Given the scale and type of program implementation in a middle-income setting, further research on these welfare outcomes would be valuable. Additional research to evaluate the impact of the dibao program in a canonical sense is also needed. Such research would require panel data with sufficient variation in dibao participation to support a plausible identification strategy. Unfortunately, panel variation in dibao participation in our CHIP data was insufficient for this purpose. For the great majority of sampled households, dibao status did not change over the observed years.

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Table 1: Official Statistics for China's Rural Dibao Program

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
rural dibao recipients (millions)	15.93	35.66	43.06	47.60	52.14	53.06	53.45	53.88	52.07	49.03
rural dibao transfers (million yuan)	na	10910	22873	36300	44500	66770	71820	86690	87030	93150
national average rural dibao threshold (yuan per person per year)	na	840	988	1210	1404	1718	2003	2434	2777	3178
national average rural dibao transfer (yuan per recipient per year)	na	466	605	816	888	1273	1344	1609	1671	1900

Note: The Ministry of Civil Affairs only started publishing data on transfers and thresholds for the rural dibao program after 2007, so data for transfers and thresholds for earlier years are missing or incomplete. Dibao transfers are the sum of dibao transfers from all levels of government. The national average transfer is calculated as rural dibao transfers in row two divided by the number of recipients in row one.

Sources: NBS (various years); Ministry of Civil Affairs (various years).

Table 2: The CHIP Rural Survey: Sample Sizes, Dibao Participation and Mean Incomes

	2007	2008	2009
Sample size			
Number of individuals	31791	31506	31317
Number of households	8000	7994	7955
Dibao participants in the sample			
Number of individuals	531	662	910
Number of households	145	176	240
Dibao participation rate			
CHIP sample (weighted)	1.91	2.03	3.01
Official data	4.99	6.12	6.90
Mean income per capita (yuan, current prices)			
CHIP sample (weighted)	4429	5096	5629
Official data	4140	4761	5153
Annual growth in mean income per capita (%, constant prices)			
CHIP sample (weighted)	na	8.0	10.8
Official data	9.5	7.9	8.6

Notes: Here and elsewhere, income per capita is defined as rural household net income as measured by the National Bureau of Statistics (NBS) divided by the number of household members. Constant-price growth rates are deflated using the NBS rural consumer price index (1.054 in 2007, 1.065 in 2008, and 0.997 in 2009). In this table CHIP sample sizes and numbers of dibao participants are not weighted. CHIP sample mean incomes and dibao participation rates are calculated using two-level (province x region) weights. The NBS publishes statistics on the national number of rural dibao participants; we divide these by published statistics on the size of the rural population to obtain the official dibao participation rates. Official data for mean income per capita are published statistics from the NBS annual rural household survey.

Sources: Official data are from NBS (various years). CHIP sample sizes and income statistics are calculated by the authors using the CHIP dataset.

Table 3: Rural Dibao Thresholds and Transfers (yuan per capita per year)

	2007	2008	2009
Dibao thresholds			
Average, all provinces	1064	1166	1428
Average, 9 provinces	1051	1151	1395
Dibao transfers			
Average county transfer, all provinces	580	707	979
Average county transfer, 9 provinces	569	697	974
Average village transfer, CHIP sample	--	732	845

Notes: Not weighted. Dibao thresholds and county-level transfers are calculated using official monthly county-level data. MOCA county-level data are monthly data. In this table, for the year 2007, we report the averages across counties for January 2008, multiplied by 12. For 2008 and 2009 we report the averages for December 2008 and December 2009, respectively, multiplied by 12.

Sources: Thresholds and county-level transfers are from MOCA data; village-level transfers are calculated using the CHIP village-level data.

Table 4: Proportion of Individuals with Income below the Local Dibao Threshold (%)

	Year	% of all individuals	% of dibao recipients
Ex post income < dibao threshold (includes dibao transfer)	2007	1.86	2.67
	2008	2.24	2.15
	2009	3.68	5.56
Ex ante income < dibao threshold (net of village average dibao transfer)	2007	--	--
	2008	2.36	7.92
	2009	3.84	10.63
Ex ante income < dibao threshold (net of county average dibao expenditure)	2007	1.93	6.36
	2008	2.35	7.72
	2009	3.94	14.25

Notes: Weighted. For dibao lines we use the county-level December dibao thresholds from MOCA, which are available for 2008 and 2009; for 2007 we use the county-level dibao thresholds for January, 2008. Ex ante incomes net of village-level dibao transfers cannot be calculated for 2007 as village dibao transfer data are not available for that year.

Sources: Authors' calculations using CHIP and MOCA data.

Table 5: Poverty Incidence Calculated Using Ex Post and Ex Ante Incomes (%)

	2007	2008	2009
Official poverty line			
Ex post income per capita (including dibao transfer)	14.77	12.52	11.23
Ex ante income per capita (net of village avg. dibao transfer)	--	12.75	11.44
Ex ante income per capita (net of county avg. dibao expenditure)	14.92	12.68	11.62
$1.25 poverty line			
Ex post income per capita (including dibao transfer)	15.01	12.83	11.40
Ex ante income per capita (net of village avg. dibao transfer)	--	13.05	11.64
Ex ante income per capita (net of county avg. dibao expenditure)	15.16	13.01	11.79
$2.00 poverty line			
Ex post income per capita (including dibao transfer)	40.91	36.64	32.57
Ex ante income per capita (net of village avg. dibao transfer)	--	36.94	32.78
Ex ante income per capita (net of county avg. dibao expenditure)	41.07	36.90	33.04

Notes: Weighted. The official poverty line is the new official poverty line of 2300 yuan announced in 2011. We adjust this back to 2007, 2008 and 2009 using the rural consumer price index published by the NBS (various years). The 2009 value of the new official poverty line is 2098 RMB. The $1.25 and $2 international poverty lines are converted to yuan using the 2005 PPP exchange rate of 4.09 (LCU per international dollar, World Development Indicators 2013, http://data.worldbank.org/data-catalog/world-development-indicators), and then adjusted forward to 2007, 2008 and 2009 using the rural consumer price index. In 2009 the $1.25 poverty line is 2118 RMB and the $2 poverty line is 3388 RMB.

Sources: Authors' calculations using the CHIP and MOCA data.

Table 6: The Poverty Gap and Dibao Expenditures

	2007	2008	2009
Poverty gap (million yuan)			
A. Calculated using ex post income per capita	60,506	58504	55633
B. Calculated using ex ante income per capita	61,923	60222	59273
C. Reduction in poverty gap (difference between B and A)	1417	1718	3640
Total dibao expenditures			
D. MOCA total dibao expenditures (million yuan)	10910	22873	36300
as a % of ex ante poverty gap	*17.6%*	*38.0%*	*61.2%*
E. CHIP total dibao expenditures (million yuan)	4950	6299	15261
as a % of ex ante poverty gap	*8.0%*	*10.5%*	*25.7%*
Average reduction in the poverty gap per yuan dibao expenditure (yuan)			
F. Calculated using MOCA total expenditures (C/D)	0.13	0.04	0.06
G. Calculated using CHIP total expenditures (C/E)	0.29	0.27	0.24

Notes: Weighted. The poverty gap is calculated using the 2011 official poverty line. Ex ante incomes are calculated by subtracting county average dibao expenditures from incomes reported in the CHIP data. MOCA total dibao expenditures are the official national totals (Table 1). CHIP total dibao expenditures are calculated as the (weighted) sum over all individuals receiving dibao in the CHIP sample of the county average transfer in the location of residence. For dibao recipients who live in counties for which MOCA county average transfer data are not available, we use the village average transfers from CHIP (available only in 2008 and 2009).

Sources: Authors' calculations using the CHIP dataset and MOCA data on county average dibao transfers.

Table 7: Targeting Errors (%)

Measure of income per capita	Error	2007	2008	2009
Ex ante, net of village avg. dibao transfer	Inclusionary	--	92.1	89.4
	Exclusionary	--	93.2	91.6
Ex ante, net of county avg. dibao expenditure	Inclusionary	93.6	92.3	85.7
	Exclusionary	93.7	93.3	89.1

Note: Weighted. Inclusion error equals the percent of dibao recipients who are not eligible (whose incomes are above the dibao thresholds); exclusion error equals the percent of eligible individuals (with incomes below the dibao thresholds) who do not receive dibao transfers.

Sources: Authors' calculations using the CHIP dataset and MOCA data on county average dibao transfers.

Table 8: Targeting Errors Relative to the Official Poverty Line (%)

Measure of income per capita	Error	2007	2008	2009
Ex ante, net of village avg. dibao transfer	Inclusionary	--	67.7	75.0
	Exclusionary	--	94.8	93.4
Ex ante, net of county avg. dibao expenditure	Inclusionary	63.6	71.1	69.2
	Exclusionary	95.3	95.4	92.0

Notes: Weighted. In this table the targeting errors are measured relative to the poverty line. In other words, the inclusionary error is the % of dibao recipients who had income above the poverty line, and the exclusionary error is the % of individuals with income below the poverty line who were not dibao recipients. Poverty classifications are based on ex ante incomes. See notes to Table 5 for explanation of the official poverty line.

Sources: Authors' calculations using the CHIP dataset and MOCA data on county average dibao transfers.

Table 9: Results of probit regressions of dibao participation

	2007	2008	2009
Household size	**-0.0017***	**-0.0021****	-0.0015
	(0.001)	(0.001)	(0.001)
Average age of adult household	-0.0001	-0.0001	-0.0003
Members	(0.000)	(0.000)	(0.000)
Share of male household members	**-0.0123****	-0.0011	-0.0118
	(0.006)	(0.006)	(0.008)
Share of household members age > 60	0.0011	0.0044	**0.0209*****
	(0.005)	(0.006)	(0.007)
Share of household members age < 16	**0.0119****	0.0031	0.0087
	(0.006)	(0.007)	(0.009)
Existence of bad health household	**0.0127*****	**0.0216*****	**0.0131*****
member	(0.004)	(0.005)	(0.005)
Existence of disabled household	**0.0181*****	**0.0188*****	**0.0442*****
member	(0.006)	(0.006)	(0.010)
Household member with migrant job	-0.0009	-0.0027	**0.0082***
	(0.002)	(0.002)	(0.005)
Share net income from wages	**-0.0096*****	**-0.0042****	**-0.0106*****
	(0.003)	(0.002)	(0.003)
Share net income from non-agricultural	**-0.0181*****	**-0.0042****	**-0.0135*****
business	(0.005)	(0.002)	(0.005)
Household has no major appliance	**0.0047****	**0.0075*****	**0.0073***
	(0.002)	(0.003)	(0.004)
Household has motorized transport	**-0.0079*****	**-0.0031**	**-0.0079****
	(0.002)	(0.002)	(0.003)
Natural disaster occurrence	0.0030	-0.0009	0.0030
	(0.002)	(0.002)	(0.003)
Marriage in household	0.0033	0.0042	**-0.0114*****
	(0.005)	(0.006)	(0.003)
Death in household	0.0021	0.0005	**0.0418****
	(0.005)	(0.007)	(0.019)
Log housing area	**-0.0062*****	-0.0011	**-0.0064****
	(0.002)	(0.002)	(0.003)
Share multi-story area	-0.0008	-0.0035	0.0010
	(0.002)	(0.003)	(0.004)
Household cultivated land area (mu)		-0.0000	**-0.0012*****
		(0.000)	(0.000)
Water flush toilet	0.0022	**-0.0100*****	-0.0035
	(0.003)	(0.002)	(0.004)
Piped water	-0.0020	-0.0033	-0.0042

	(0.002)	(0.002)	(0.003)
Revolutionary area	0.0091	0.0168	-0.0019
	(0.010)	(0.013)	(0.007)
Mountainous area	**-0.0058***	0.0000	0.0015
	(0.003)	(0.008)	(0.010)
Road covered by asphalt/cement	-0.0005	0.0032	-0.0008
	(0.002)	(0.002)	(0.003)
Distance to township gov't > 10 km	**-0.0062***	0.0029	0.0116
	(0.004)	(0.010)	(0.014)
Distance to county seat > 20 km	0.0068	-0.0011	0.0074
	(0.007)	(0.005)	(0.007)
Log likelihood	-615.4	-714.5	-822.8
Likelihood ratio test $\chi^2(33)$	219.5	261.6	291.5
Pseudo R^2	0.151	0.155	0.150
Observations	7,997	7,981	7,381

Notes: Estimated over households, without weights. The table reports marginal effects, evaluated at the mean of the data. Standard errors are in parentheses. The regressions also included controls for province fixed effects (not reported). Henan had a significant, positive coefficient in all three years and Chongqing and Guangdong had significant, positive coefficients in 2008 and 2009 with Hebei as reference province. The regressions were estimated including some additional explanatory variables such as years of schooling, but since the coefficients were uniformly not significant, these variables were dropped. The regressions were also estimated using logit and a linear probability model, with very similar results. Statistically significant coefficients are shown in bold. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Targeting Errors Using Propensity Scores (%)

	2007	2008	2009
Inclusionary	84.6	84.4	83.5
Exclusionary	84.6	84.4	83.5

Note: Weighted. Inclusionary error is the percent of dibao recipients who are not eligible according to the propensity score method; exclusionary error equals the percent of eligible individuals (according to the propensity score method) who did not receive dibao transfers. Eligibility is determined using propensity scores calculated from the probit estimates in Table 9. The propensity score threshold for each year is created by counting off individuals ranked from highest to lowest propensity score, starting from the highest propensity score, until reaching the number of dibao individuals in the survey that year. By construction, in the propensity score approach the number of eligible individuals is exactly equal to the number of recipient individuals. Consequently , in the propensity score approach inclusionary and exclusionary errors are the same because the number of eligible individuals is exactly equal to the number of recipient individuals.
Sources: Authors' calculations using the CHIP data.

Table 11: Simulations: Expanding Coverage versus Increasing Transfers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
							Change in poverty measures relative to baseline (%)		
	Budget (mill. yuan)	Number of recipients	Transfer amounts	Poverty rate	Poverty gap index	Squared Poverty gap	Poverty rate	Poverty gap	Squared poverty gap
Baseline ("observed" base case)	13580	20398820	local	11.23	3.91	7.67			
a) Increase transfers	2.54 x base	base	2.54 x local	10.89	3.78	7.59	-3.03	-3.32	-1.04
b) Expand coverage (to all eligible, perfect targeting)	2.54 x base	2.17 x base	local	10.64	2.97	6.33	-5.25	-24.04	-17.47
c) Expand coverage (random selection)	2.54 x base	2.56 x base	local	10.88	3.79	7.58	-3.12	-3.07	-1.17

Notes: The baseline case is calculated using rural population weights and observed dibao participation in the 2009 CHIP data. Dibao transfer amounts are assumed to equal the local average transfer in the village of residence (where village data are missing, we use the county average from MOCA). All simulations assume that dibao transfers continue to go to all original recipients in the baseline case. The expanded budget used in these simulations is 2.54 times the base budget, which is the amount of funding required by simulation (b) in which transfers go to the original recipients plus any other individuals who were not original recipients but who are eligible, i.e., whose incomes are below their local dibao thresholds. Simulation (a) assumes that the recipients are the same as in the baseline and increases the transfer amount received by each recipient by 2.54 times. Simulation (b) assumes that the transfer amounts remain unchanged and expands the program to cover all households with incomes below their local dibao thresholds. Simulation (c) assumes that the transfer amounts remain unchanged and expands the program by adding additional recipients who are selected randomly from among all non-recipients until the target budget is exhausted. In all cases poverty levels are calculated using the official poverty line.

Table 12: Simulations: Adopting a Uniform Transfer

	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
							Change in poverty measures relative to baseline (%)		
	Budget (mill. yuan)	Number of recipients	Transfer amounts	Poverty rate	Poverty gap index	Squared Poverty gap	Poverty rate	Poverty gap	Squared poverty gap
Baseline ("observed" base case)	13580	20398820	local	11.23	3.91	7.67			
d) Uniform transfer, observed targeting	base	base	666 yuan	11.17	3.93	7.67	-0.53	0.51	0.00
Baseline ("perfect targeting" base case)	23710	26717666	local	10.85	3.04	6.35			
e) Uniform transfer, perfect targeting	base	base	887 yuan	10.75	2.68	6.19	-0.92	-11.84	-2.52

Notes: The "observed" baseline is the same as in Table 11. Simulation (d) assumes that dibao transfers continue to go to dibao recipients in the "observed" baseline, but transfers amounts are now uniform and equal to the average "observed" baseline transfer (666 yuan). The "perfect targeting" baseline is a simulation in which there is perfect targeting based on the existing local dibao thresholds and transfers: all individuals with income below their local dibao threshold receive the local dibao transfer, and no individuals with income above their local dibao threshold receive a transfer. Simulation (e) is the same as the "perfect targeting" baseline, but transfer amounts are now uniform and equal to the average transfer in the "perfect targeting" baseline (887 yuan). In all cases poverty levels are calculated using the official poverty line.

Table 13: Simulations: Adopting a Uniform Eligibility Threshold

	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
							Change in poverty relative to baseline (%)		
	Budget (mill. yuan)	Number of recipients	Transfer amount	Poverty rate	Poverty gap index	Squared Poverty gap	Rate	Gap	Squared gap
Baseline ("perfect targeting" base case)	23710	26717666	local	10.85	3.04	6.35			
f) Uniform threshold (distance to poverty line)	base	1.21 x base	local	10.90	2.72	6.19	0.46	-10.53	-2.52
g) Uniform threshold (lottery among the poor)	base	1.28 x base	local	9.94	2.81	6.53	-8.39	-7.57	2.83
h) Uniform threshold and uniform transfer (distance to poverty line)	base	base	887 yuan	10.96	2.49	6.07	1.01	-18.09	-4.41
i) Uniform threshold and uniform transfer (lottery among the poor)	base	base	887 yuan	10.00	2.61	6.43	-7.83	-14.14	1.26

Notes: The "perfect targeting" baseline is the same as in Table 12. Simulation (f) assumes a uniform threshold equal to the official poverty line, with perfect targeting based on depth of poverty. Recipients are selected starting with the poorest (those furthest below the official poverty line) and given the local transfer until the baseline budget is used up. Simulation (g) also assumes a uniform threshold equal to the official poverty line, but dibao recipients are randomly selected from among the poor and given the local transfer until the baseline budget is used up. Simulations (h) and (g) combine uniform thresholds and uniform transfers. Simulation (h) is the same as simulation (f) but transfers are uniform and equal to the average transfer in the "perfect targeting" baseline. Simulation (i) is the same as simulation (g) but transfers are uniform and equal to the average transfer in the "perfect targeting" baseline. In all cases poverty levels are calculated using the official poverty line.

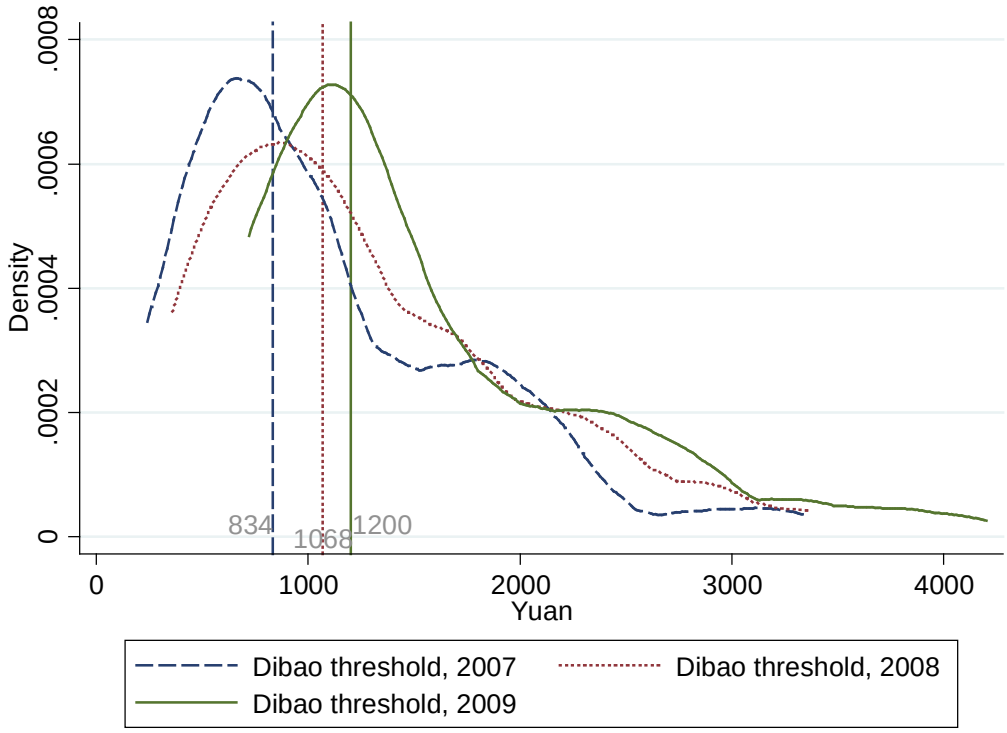

Figure 1: The Distribution of County-level Dibao Thresholds, by Year (yuan per person per year)

Note: This figure shows the distribution of dibao thresholds for counties covered in the CHIP rural sample. For the year 2007, the January 2008 dibao threshold values were used. For 2008 and 2009, the December 2008 and 2009 threshold values were used. Vertical lines represent the yearly median threshold values, which were 834, 1,068 and 1,200 yuan for 2007, 2008 and 2009, respectively.

Source: Data from MOCA.

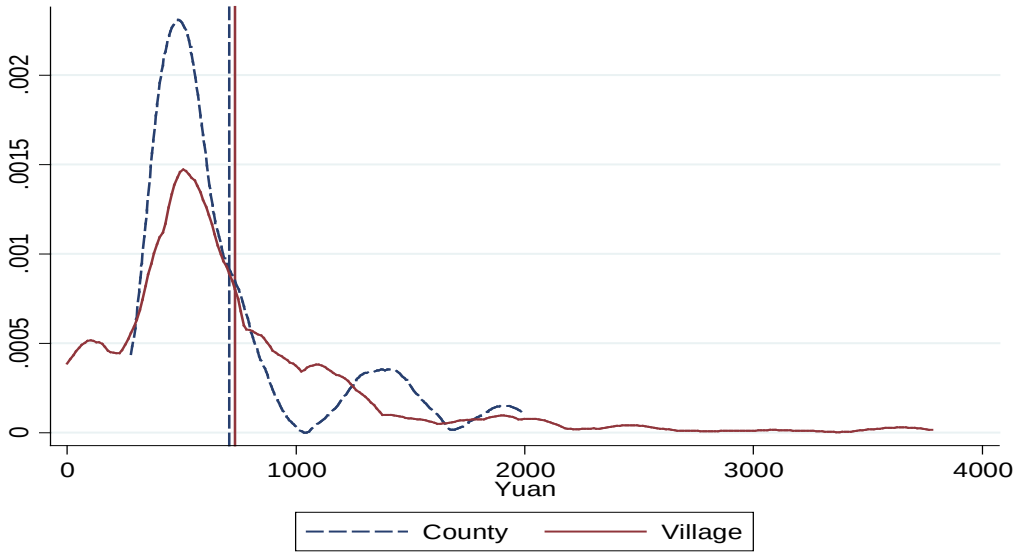

Figure 2a: The Distribution of County and Village Average Dibao Transfers, 2008 (yuan per recipient)

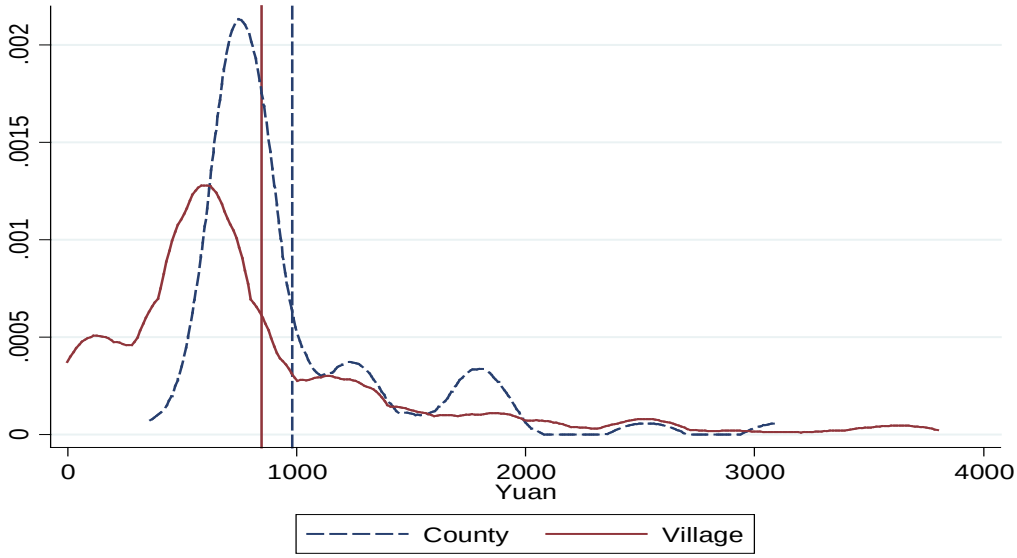

Figure 2b: The Distribution of County and Village Average Dibao transfers, 2009 (yuan per recipient)

Note: County transfers shown in Figures 2a and 2b are restricted to counties covered in the CHIP survey. Village transfers are for villages covered in the CHIP survey. Outliers (higher than 4000 yuan) have been removed. The dashed vertical lines represent the average village transfer for CHIP villages; the dotted vertical lines represent the average county transfer for CHIP counties.

Source: Authors' calculation based on data from CHIP and MOCA.

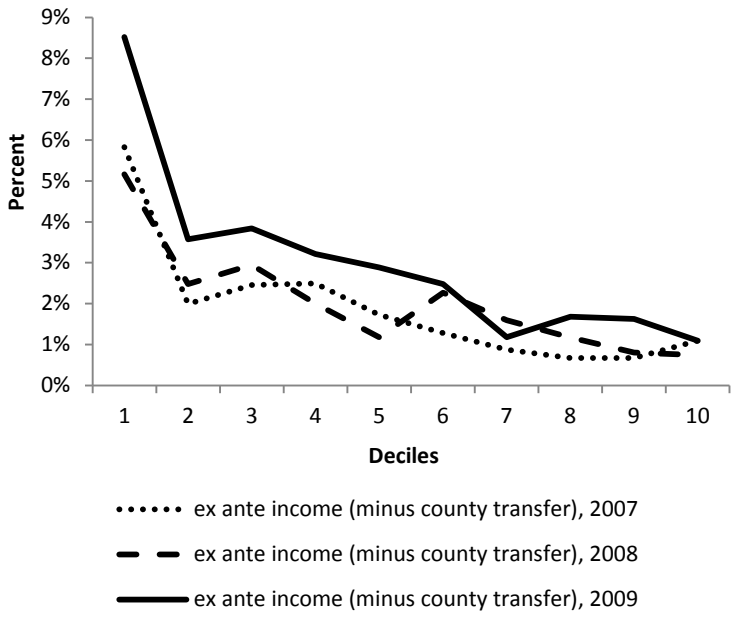

Figure 3: Dibao Participation Rates by Ex Ante Income Decile (%)

Notes: Weighted. This figure shows dibao participation rates for individuals by decile groups, from poorest (1st decile) to richest (10th decile), based on ex ante income per capita. Estimates of ex ante income are calculated using the CHIP income data and average county-level dibao expenditures. Using average village-level transfers gives very similar results.
Source: Authors' calculation based on data from CHIP and MOCA.

Appendix

Table A1: Characteristics of Dibao and Non-dibao Households, 2007

	Non-dibao mean	*SD*	Dibao mean	*SD*	Dibao mean as a % of non-dibao
Household characteristics					
Per capita income	5263	*4347*	3789	*2859*	72%
Ex ante per capita income (village correction)	.	.	.	.	
Ex ante per capita income (county correction)	5263	*4347*	3369	*2821*	64%
Household size	3.980	*1.359*	3.662	*1.464*	92%
Average age of adult household members	41.71	*9.568*	45.79	*11.661*	110%
Years of schooling of household head	7.487	*2.337*	6.752	*2.503*	90%
Share of male household members	0.523	*0.146*	0.504	*0.181*	96%
Share of household members age > 60	0.102	*0.222*	0.195	*0.300*	191%
Share of household members age < 16	0.150	*0.172*	0.161	*0.183*	107%
Existence of bad health household member (dummy)	0.137	*0.344*	0.407	*0.493*	297%
Existence of disabled household member (dummy)	0.116	*0.321*	0.352	*0.479*	303%
Existence of household member with migrant job (dummy)	0.408	*0.491*	0.352	*0.479*	86%
Share net income from wages	0.426	*0.414*	0.315	*0.293*	74%
Share net income from non-agricultural business	0.094	*0.399*	0.025	*0.099*	27%
Household has no major appliance (refrigerators, etc.) (dummy)	0.370	*0.483*	0.641	*0.481*	173%
Household has motorized transport means (dummy)	0.475	*0.499*	0.193	*0.396*	41%
Marriage in household (dummy)	0.046	*0.21*	0.062	*0.242*	135%
Death in household (dummy)	0.036	*0.185*	0.034	*0.183*	94%
Log housing area	4.798	*0.518*	4.476	*0.532*	93%
Share of housing area that is multi-story	0.492	*0.47*	0.303	*0.447*	62%
Household cultivated land area	.	.	.	.	
Water flush toilet (dummy)	0.271	*0.444*	0.131	*0.339*	48%
Existence of piped water (dummy)	0.416	*0.493*	0.234	*0.425*	56%
Village characteristics					
Natural disaster occurrence (dummy)	0.551	*0.497*	0.683	*0.467*	124%
Revolutionary area (dummy)	0.028	*0.164*	0.048	*0.215*	171%
Mountainous area (dummy)	0.015	*0.123*	0.014	*0.117*	93%
Road covered by asphalt/cement (dummy)	0.437	*0.496*	0.297	*0.458*	68%
Distance to township gov't > 10 km	0.012	*0.108*	0.007	*0.083*	58%
Distance to county seat > 20 km	0.052	*0.222*	0.083	*0.276*	160%

Table A2: Characteristics of Dibao and Non-dibao Households, 2008

	Non-dibao mean	*SD*	Dibao mean	*SD*	Dibao mean as a % of non-dibao
Household characteristics					
Per capita income	6030	*4893*	4253	*2778*	71%
Ex ante per capita income (village correction)	6030	*4893*	3608	*2737*	60%
Ex ante per capita income (county correction)	6030	*4893*	3694	*2745*	61%
Household size	3.945	*1.39*	3.761	*1.481*	95%
Average age of adult household members	42.46	*9.836*	46.18	*11.988*	109%
Years of schooling of household head	7.501	*2.312*	6.519	*2.409*	87%
Share of male household members	0.522	*0.148*	0.527	*0.199*	101%
Share of household members age > 60	0.116	*0.239*	0.213	*0.312*	184%
Share of household members age < 16	0.139	*0.166*	0.133	*0.174*	96%
Existence of bad health household member (dummy)	0.153	*0.360*	0.455	*0.499*	297%
Existence of disabled household member (dummy)	0.120	*0.325*	0.358	*0.481*	298%
Existence of household member with migrant job (dummy)	0.374	*0.484*	0.330	*0.471*	88%
Share net income from wages	0.472	*2.000*	0.330	*0.285*	70%
Share net income from non-agricultural business	0.065	*1.899*	0.030	*0.125*	46%
Household has no major appliance (refrigerators, etc.) (dummy)	0.331	*0.471*	0.585	*0.494*	177%
Household has motorized transport means (dummy)	0.490	*0.500*	0.358	*0.481*	73%
Marriage in household (dummy)	0.043	*0.204*	0.040	*0.196*	93%
Death in household (dummy)	0.022	*0.146*	0.023	*0.149*	105%
Log housing area	4.812	*0.534*	4.597	*0.590*	96%
Share of housing area that is multi-story	0.511	*0.465*	0.335	*0.456*	66%
Household cultivated land area	4.452	*5.302*	4.357	*3.805*	98%
Water flush toilet (dummy)	0.293	*0.455*	0.119	*0.325*	41%
Existence of piped water (dummy)	0.428	*0.495*	0.273	*0.447*	64%
Village characteristics					
Natural disaster occurrence (dummy)	0.377	*0.485*	0.369	*0.484*	98%
Revolutionary area (dummy)	0.028	*0.165*	0.051	*0.221*	182%
Mountainous area (dummy)	0.015	*0.121*	0.028	*0.167*	187%
Road covered by asphalt/cement (dummy)	0.468	*0.499*	0.415	*0.494*	89%
Distance to township gov't > 10 km	0.012	*0.107*	0.023	*0.149*	192%
Distance to county seat > 20 km	0.052	*0.223*	0.074	*0.262*	142%

Table A3: Characteristics of Dibao and Non-dibao Households, 2009

	Non-dibao mean	*SD*	Dibao mean	*SD*	Dibao mean as a % of non-dibao
Household characteristics					
Per capita income	6652	*6033*	4725	*3282*	71%
Ex ante per capita income (village correction)	6652	*6033*	4130	*3241*	62%
Ex ante per capita income (county correction)	6652	*6033*	3856	*3146*	58%
Household size	3.94	*1.42*	3.79	*1.555*	96%
Average age of adult household members	43.05	*9.976*	47.15	*12.652*	110%
Years of schooling of household head	7.467	*2.336*	6.725	*2.526*	90%
Share of male household members	0.522	*0.149*	0.511	*0.179*	98%
Share of household members age > 60	0.128	*0.252*	0.251	*0.333*	196%
Share of household members age < 16	0.129	*0.162*	0.123	*0.161*	95%
Existence of bad health household member (dummy)	0.139	*0.346*	0.346	*0.477*	249%
Existence of disabled household member (dummy)	0.089	*0.285*	0.267	*0.443*	300%
Existence of household member with migrant job (dummy)	0.169	*0.375*	0.242	*0.429*	143%
Share net income from wages	0.462	*0.399*	0.362	*0.311*	78%
Share net income from non-agricultural business	0.067	*0.269*	0.015	*0.072*	22%
Household has no major appliance (refrigerators, etc.) (dummy)	0.259	*0.438*	0.486	*0.501*	188%
Household has motorized transport means (dummy)	0.517	*0.500*	0.329	*0.471*	64%
Marriage in household (dummy)	0.050	*0.218*	0.021	*0.143*	42%
Death in household (dummy)	0.018	*0.132*	0.046	*0.210*	256%
Log housing area	4.852	*0.526*	4.596	*0.547*	95%
Share of housing area that is multi-story	0.511	*0.465*	0.361	*0.456*	71%
Household cultivated land area	4.551	*4.290*	3.708	*3.012*	81%
Water flush toilet (dummy)	0.364	*0.481*	0.231	*0.422*	63%
Existence of piped water (dummy)	0.542	*0.498*	0.430	*0.496*	79%
Village characteristics					
Natural disaster occurrence (dummy)	0.326	*0.469*	0.412	*0.493*	126%
Revolutionary area (dummy)	0.036	*0.187*	0.045	*0.207*	125%
Mountainous area (dummy)	0.021	*0.144*	0.039	*0.193*	186%
Road covered by asphalt/cement (dummy)	0.506	*0.500*	0.408	*0.493*	81%
Distance to township gov't > 10 km	0.014	*0.119*	0.033	*0.18*	236%
Distance to county seat > 20 km	0.066	*0.249*	0.104	*0.306*	158%

Notes to Tables A1, A2 and A3: Unweighted. 2007 values are calculated over 7855 non-dibao and 145 dibao households; 2008 and 2009 values are calculated over 7818 and 176, and 7715 and 240, non-dibao and dibao households, respectively. For some variables the number of observations is lower due to some missing values.

Table A4: Determinants of dibao participation, comparison of different model specifications

	2007			2008			2009		
	Probit	Logit	LPM	Probit	Logit	LPM	Probit	Logit	LPM
Household size	-0.0017*	-0.0016**	-0.0039**	-0.0021**	-0.0021**	-0.0047***	-0.0012	-0.0013	-0.0036*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Average age of adult household members	-0.0001	-0.0001	-0.0002	-0.0001	-0.0001	-0.0002	-0.0001	-0.0002	-0.0004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of male household members	-0.0123**	-0.0086*	-0.0161	-0.0011	0.0008	0.0010	-0.0116	-0.0104	-0.0166
	(0.006)	(0.005)	(0.012)	(0.006)	(0.006)	(0.014)	(0.008)	(0.007)	(0.016)
Share of household members age > 60	0.0011	0.0003	0.0043	0.0044	0.0030	0.0093	0.0160**	0.0134**	0.0360**
	(0.005)	(0.004)	(0.012)	(0.006)	(0.005)	(0.012)	(0.007)	(0.006)	(0.015)
Share of household members age < 16	0.0119**	0.0112**	0.0248**	0.0031	0.0037	0.0117	0.0079	0.0063	0.0131
	(0.006)	(0.005)	(0.010)	(0.007)	(0.006)	(0.011)	(0.009)	(0.008)	(0.014)
Existence of bad health household member	0.0127***	0.0101***	0.0251***	0.0216***	0.0181***	0.0353***	0.0126**	0.0110**	0.0251***
	(0.004)	(0.003)	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.008)
Existence of disabled household member	0.0181***	0.0148***	0.0304***	0.0188***	0.0157***	0.0321***	0.0434***	0.0367***	0.0537***
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.008)	(0.010)	(0.009)	(0.011)
Household member with migrant job	-0.0009	-0.0006	-0.0026	-0.0027	-0.0020	-0.0047	0.0086*	0.0074*	0.0085
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.007)
Share net income from wages	-0.0096***	-0.0083***	-0.0172***	-0.0042**	-0.0026**	-0.0044	-0.0104***	-0.0086***	-0.0193***
	(0.003)	(0.003)	(0.005)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)	(0.006)
Share net income from non-agricultural business	-0.0181***	-0.0147***	-0.0162***	-0.0042**	-0.0027*	-0.0044	-0.0135***	-0.0097*	-0.0188***
	(0.005)	(0.004)	(0.004)	(0.002)	(0.001)	(0.003)	(0.005)	(0.005)	(0.006)
Household has no major appliance	0.0047**	0.0041**	0.0100***	0.0075***	0.0065***	0.0137***	0.0072*	0.0065**	0.0151***
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.006)
Household has motorized transport	-0.0079***	-0.0073***	-0.0118***	-0.0031	-0.0027	-0.0058*	-0.0078**	-0.0071**	-0.0118***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Natural disaster occurrence	0.0030	0.0029*	0.0047*	-0.0009	-0.0005	-0.0028	0.0032	0.0030	0.0044
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.005)
Marriage in household	0.0033	0.0034	0.0082	0.0042	0.0028	0.0042	-0.0113***	-0.0107***	-0.0154**
	(0.005)	(0.004)	(0.008)	(0.006)	(0.005)	(0.008)	(0.003)	(0.003)	(0.006)
Death in household	0.0021	-0.0007	0.0008	0.0005	0.0007	-0.0007	0.0408**	0.0277*	0.0503**
	(0.005)	(0.004)	(0.008)	(0.007)	(0.006)	(0.011)	(0.019)	(0.015)	(0.023)
Log housing area	-0.0066**	-0.0056**	-0.0120**	-0.0011	-0.0004	-0.0011	-0.0066**	-0.0056**	-0.0120**

	0.0062***	0.0055***	0.0106***						
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.005)
Share multi-story area	-0.0008	-0.0007	-0.0025	-0.0035	-0.0036	-0.0082	0.0012	0.0004	0.0010
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.004)	(0.003)	(0.006)
Household cultivated land area (mu)				-0.0000	-0.0000	-0.0002	-0.0012***	-0.0012***	-0.0017***
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Water flush toilet	0.0022	0.0019	0.0051	-0.0100***	-0.0082***	-0.0119**	-0.0035	-0.0027	-0.0038
	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.005)	(0.004)	(0.003)	(0.006)
Piped water	-0.0020	-0.0024	-0.0032	-0.0033	-0.0033	-0.0066	-0.0041	-0.0041	-0.0067
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.005)
Revolutionary area	0.0091	0.0069	0.0153	0.0168	0.0131	0.0188	-0.0017	-0.0027	-0.0011
	(0.010)	(0.008)	(0.012)	(0.013)	(0.011)	(0.013)	(0.007)	(0.006)	(0.013)
Mountainous area	-0.0058*	-0.0053*	-0.0178	0.0000	-0.0009	0.0031	0.0013	-0.0016	-0.0037
	(0.003)	(0.003)	(0.012)	(0.008)	(0.006)	(0.019)	(0.010)	(0.008)	(0.020)
Road covered by asphalt/cement	-0.0005	-0.0003	-0.0009	0.0032	0.0024	0.0057	-0.0008	-0.0006	0.0016
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)
Distance to township gov't > 10 km	-0.0062*	-0.0056	-0.0195*	0.0029	0.0019	0.0066	0.0117	0.0086	0.0236
	(0.004)	(0.003)	(0.011)	(0.010)	(0.008)	(0.022)	(0.014)	(0.011)	(0.024)
Distance to county seat > 20 km	0.0068	0.0061	0.0130	-0.0011	0.0004	0.0003	0.0073	0.0089	0.0141
	(0.007)	(0.005)	(0.010)	(0.005)	(0.004)	(0.009)	(0.007)	(0.007)	(0.010)
Log likelihood	-615.4	-613.4	4889.79	-714.5	-716.1	4138.37	-823.9	-827.4	2869.55
Likelihood ratio test $\chi^2(33)$	219.5	223.5	3.16	261.6	258.6	4.01	289.3	282.4	4.83
Pseudo R^2	0.151	0.154	0.032	0.155	0.153	0.038	0.149	0.146	0.0443
Observations	7,997	7,997	7997	7,981	7,981	7,981	7,381	7,381	7,381

Notes: Estimated over households, without weights. Standard errors are in parentheses and robust standard errors are in parentheses for the linear probability model. For the Logit and Probit models marginal effects are reported evaluated at the mean of the data. The regressions also included controls for province fixed effects (not reported) with Hebei as reference province. R^2 and F-test statistic are reported for the LPM.
*** p<0.01, ** p<0.05, * p<0.1.

Online Appendix: Accounting approach to estimating pre-transfer incomes

In our analysis of China's rural dibao program, we use the accounting approach to estimate pre-transfer household incomes. The accounting approach is simple and straightforward: pre-transfer income is equal to observed household income, including the cash transfer received by the household, minus the cash transfer.

This approach to estimating pre-transfer income is common in the literature (Atkinson and Sutherland (1989), Sahn and Younger (2003) and Lustig et al. (2014)); however, it has certain limitations. First, cash transfer programs can create disincentives that cause households to reduce their effort to earn income (Ravallion and Chen (2015)). Such effects are likely to arise if program administrators can easily observe changes in household incomes and will reduce the amount of the transfer accordingly, i.e., the benefit withdrawal rate is high. In the presence of such behavioral responses, the accounting approach will understate the true counterfactual pre-transfer incomes. Second, there may be positive spillover effects (Angelucci and di Maro (2016)). For example, households may pool or share transfers in order to purchase public goods, and transfers may create externalities through long-term general equilibrium effects. In the presence of spillover effects, the accounting approach can overstate the true counterfactual pre-transfer incomes. The interactions between household-specific behavioral responses, spillover effects due to inter-household cash and in-kind transfers, and short- and long-term general equilibrium effects on poverty make it difficult to identify the direction of bias and so create challenges for identifying the causal effects of cash transfers on household incomes and other outcomes (Debowicz and Golan, 2014).

We acknowledge that these issues can apply to our analysis of China's rural dibao program. In this appendix, however, we present evidence to support the view that incentive effects are not significant for the rural dibao program. In addition, as discussed in section three of the paper, we note that a study of China's urban dibao program by Ravallion and Chen (2015) did not find evidence of

substantial incentive effects. Incentive effects are less likely in the rural than the urban dibao program, because in rural areas the program's administration is weaker, the transfer amounts are smaller, and household incomes are less easily observed.

Here we use the panel aspect of the data to assess the potential effect of the dibao program on behavioral outcomes, so as to explore whether the "fixed income" assumption of the accounting approach is appropriate. Our identification strategy relies on a difference-in-differences (DD) estimator and panel (time) variation across the 2007, 2008 and 2009 years of the CHIP data. We used a standard DD equation:

$$y_{it} = \gamma_t + d_{it}\beta_1 + x_{it}\beta_2 + \alpha_i + \varepsilon_{it}, \qquad t = 2007, 2008, 2009,$$

where y_{it} is an outcome variable for household *i* at time *t*, and d_{it} is a binary indicator that takes the value one if household *i* receives the dibao transfer in period *t*. γ_t is a set of dummy variables for the years 2008 and 2009 that measure aggregate time effects, and x_{it} is a set of time varying controls. The parameter estimate of $\widehat{\beta_1}$ is the panel data equivalent of the DD estimate. To remove possible heterogeneity bias, we demean the data using the fixed effects (FE) estimator.

We estimate this equation using several different outcome variables. The choice of outcome variables y_{it} was guided by the logic that the DD analysis should capture important earnings-related behaviors that may have been influenced by dibao participation. The outcome variables we investigate are:

1. The amount of household income from migrant work (Yuan)
2. A binary indicator that equals one if the household received any income from migrant work
3. A binary indicator that equals one if any household member lived more than three months away from home for work purposes
4. The amount of household wage income from wage employment in the local area (Yuan)

5. A binary indicator that equals one if the household received any wage income from wage employment in the local area
6. The amount of net income from farming (Yuan)
7. A binary indicator that equals one if the household received any income from farming
8. The amount of non-farm business net income (Yuan)
9. A binary indicator that equals one if the household received any income from non-farm businesses
10. Total hours of work in the past week by all working household members in their primary jobs (note: data on hours of work are only available for the primary job)

Reassuringly, the DD results, presented in the Table 1 below, show no significant dibao effects for almost all of the dependent variables. The only exception is non-farm business revenues, for which dibao has a significant, negative coefficient. The size of this coefficient is fairly large; however, income from non-farm business constitutes a relatively minor source of household income (see Tables A1, A2 and A3). Furthermore, given the limited variation across time of dibao participation in the panel, this result is highly sensitive to outliers. Once we exclude households that experienced a change in their dibao status and an extreme change in non-farm business revenues during the time of the survey, the magnitude of the parameter estimate of dibao participation as well as its statistical significance changes. None of the other dependent variables—income from migrant work, migrant work participation, local wage income, local wage employment, farming income, farm business participation, non-farm business participation, and total hours worked—have a significant relationship with the dibao variable. These results suggest that incentive effects of the dibao program are limited.

Although the results in Table A1 are reassuring, we suspect the DD approach may not yield a very robust analysis because time variation in dibao participation is limited. To provide a sense of

variation in the panel, of those households that did not receive dibao in 2007 and were surveyed in 2008 (7,799 household observations) only 1.06 percent received the dibao in 2008 (83 observations). Of those that received dibao in 2007 (145 household observations), 60 percent continued in dibao in 2008 (87 observations). Of those starting off without dibao in 2008, 1.44 percent received dibao in 2009, while of those that received the dibao in 2008, 75.29 percent still received it in 2009. These numbers show some variation for those households that were initially dibao recipients, but for the great majority of sampled households, dibao status did not change. The limited amount of variation in dibao status provides a challenge for conducting rigorous panel analysis, which would require empirical methods such as "balancing" (trimming and weighting) the sample to adjust for variation of "observed" characteristics of the treatment and control groups as part of DD analysis (Galasso and Umapathi, 2009).

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Table 1: Difference-in-Differences Estimates of Dibao Participation on Behavioral Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Income from migration (Yuan)	Income from migration?	Household member lives more than 3 months away?	Local wage income (Yuan)	Received local wage income?	Farming net income (Yuan)	Received farming income?	Non-farm business net income (Yuan)	Received non-farm business income?	Total hours worked
Dibao	**-59.7865**	**-0.0255**	**-0.0109**	**-150.2863**	**0.0139**	**-387.7202**	**0.0012**	**-610.6760****	**-0.0073**	**0.0381**
	(291.183)	(0.025)	(0.029)	(212.021)	(0.027)	(495.753)	(0.002)	(271.240)	(0.024)	(3.868)
Observations	22,179	23,181	23,181	22,612	23,181	22,902	23,181	21,993	23,181	16,490
Number of households	7979	7979	7979	7979	7979	7979	7979	7979	7979	6654
R2w	0.0266	0.00120	0.131	0.0276	0.00119	0.00679	0.00361	0.00563	0.00267	0.00601

Note: All specifications presented in the table control for variables capturing changes in the household composition and marital status of the household head, whether there are any disabled household members, an indicator whether the household was affected by an unanticipated shock, an indicator capturing if a household member suffered from bad health and time dummy variables (estimated coefficients are not reported).