

Article

# Has China's New Round of Collective Forestland Tenure Reform Caused an Increase in Rural Labor Transfer?

Liu Yang <sup>†</sup> and Yang Ren <sup>\*,†</sup>

School of Public Affairs and Administration, University of Electronic Science and Technology of China, No. 2006 Xiyuan Road, Chengdu 611731, China; yangliu@uestc.edu.cn

\* Correspondence: ren.yang@uestc.edu.cn; Tel.: +86-028-6183-1867

† These authors contributed equally to this research work.

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**Abstract:** To investigate the rural labor transfer effects of China's Collective Forestland Tenure Reform (CFTR), we employ binary probit models by using survey data of 694 households from China's northern collective forest areas. The results reveal that the improved property rights, including rights for forestland use, disposition and beneficiaries, and refined tenure security under the CFTR generally have caused an increase in rural household labor transfer to the nonfarm sector. Besides, we find that forestry-dominated households' risk perceptions on forestland reallocation and expropriation have significantly dampened rural labor transfer to the nonfarm sector. These can be explained by the fact that the strengthening of forestland property rights brought about by the CFTR can promote an increase in the forestland transfer rate and improve the forestland relocation efficiency. This, in turn, will lead to the liberation of the rural labor force, increase the non-agricultural employment rate of farmers, and ultimately lead to an increase in the rural labor transfer to the nonfarm sector. Therefore, these findings indicate that to motivate rural labor transfer to the nonfarm sector in the context of the Chinese government's call for urbanization and other developing countries' handling of similar circumstances, policymakers should further refine household forestland property rights and better protect forestland tenure security by continuing to improve related forestry policies.

**Keywords:** forestland tenure reform; property rights; tenure security; rural labor transfer; China

## 1. Introduction

There are about 300.97 million hectares of forestland in China, of which 38% comprises state-owned forestland and 62% comprises collective-owned forestland [1]. Before 2002, the property rights and tenure security of China's collective forestland remained disordered and unstable, which significantly undermined the production efficiency of the collective forests [2]. This is mainly why 62% of the collective forestland contributes less than 43% of the total timber production of China and why the stocking level of the collective forestland is far lower than the international average standards [3]. To protect the interests of farmers engaged in forestry production and improve the production efficiency of the collective forestland, China's Collective Forestland Tenure Reform (CFTR) was launched. Besides these core aims, there is an indirect aim of promoting rural labor transfer from forestry production to non-agricultural production sectors. The CFTR mainly includes two parts: the main reform and the supplementary reform. The main reform started from 2003 on a large scale in the northern collective forest region of China. During the main reform, the village collectives were required to devolve the property rights of collective forestland to households through issuing them forestland certificates [4]. Although the ownership of the forestland stills belongs to village

collectives, the forestland certificates will empower the farmers with the rights to forestland use, disposition, and beneficiaries [5]. As a result of the main reform, almost 99% of China's collective forestland was devolved from village collectives to local households by the end of the main reform, in late 2012 [6]. By the end of 2016, the certificated collective forestland had enlarged to an area of 180 million hectares [7], and the contract period for the forestland had been extended to 70 years [1]. The supplementary reform which followed mainly aims to further improve the forestland property rights of farmers and make the forestry policies related to these property rights more secure and intact [8].

In the forest policy research area, the property rights of forestland have been heatedly discussed for decades. This is because the forestland property rights can adjust the broad and complex relationship between forestry production farmers and forestland [9–12]. Almost all forestry-related decisions by farmers can be affected by the forestland tenure system arrangements [13]. The relationship between forestland property rights and farmers' forestry investment behaviors have been thoroughly investigated [14]. In the context of the CFTR, some scholars have found that the improved forestland property rights after the CFTR have motivated forestry-dominated farmers to enlarge their investment scale [12,15]. Additionally, the relaxing government control and direct intervention in private forestry operations after the reform also improve farmers' confidence to conduct forestry production [16]. On the other hand, some research has found that forestland parcelization resulting from the CFTR has dampened the household forestry production efficiency and, thus, reduced households' incentives towards forestry investment [17,18].

Forestland tenure directly influences farmers' forestry production behavior through affecting the benefits and costs of forestry production stakeholders [6,19]. Thus, the devolved forestland property rights and adjusted tenure security could affect farmers' choices on forestry production investment [20]. As rational economic entities, Chinese rural households look to maximizing profit as the primary motivation for managing their forests [21]. Therefore, for example, if farmers expect and believe that the CFTR could bring them a better functioning forest tenure system, those farmers who rely more on forestry would likely enlarge their forestry production scale [8]. In this situation, they might rent more forestland from farmers in the same village [22,23]. Theoretically, the farmers who rent out forestland would have tended to conduct this kind of forestland transfer following the CFTR [24]. This is because the improved tenure system could guarantee and protect their forestland rental income. After these farmers rent out the forestland, they could use more labor freed from forestry production to engage in non-agricultural production. In this way, they would find that the sum of forestland rental income plus the extra non-agricultural employment income would be higher than the original income from forestry production. Generally speaking, on the one hand, farmers who focus on forestry production can achieve economies of scale by expanding the scale of forestry production, thereby increasing their production margins [25,26]. Therefore, they are willing to rent forestland from other farmers in the same village. On the other hand, farmers who lease forestland can not only obtain stable and considerable income from the leasing of forest land but also obtain more non-agricultural income. This can ensure greater family income. Therefore, these farmers are also very willing to rent out their forestland [27]. This is how the CFTR can have impacts on both forestland transfer and motivate the rural labor force to transfer into the nonfarm sector.

Although we can tell there might be a strong causal relationship between the CFTR and the transfer of rural labor according to the above theoretical analysis, unfortunately, few scholars have confirmed this hypothesis through empirical research [28,29]. Thus, to fill this clear knowledge gap, this study aims to analyze household labor allocation responses to the CFTR. More specifically, the purpose of the present study is to investigate the effect of improved property rights and refined tenure security under the CFTR on rural household labor transfer to the nonfarm sector. To conduct the empirical analysis, we employ binary probit models by using household survey data collected from China's northern collective forest region. This inquiry could extend the prior literature evaluating the performance of the

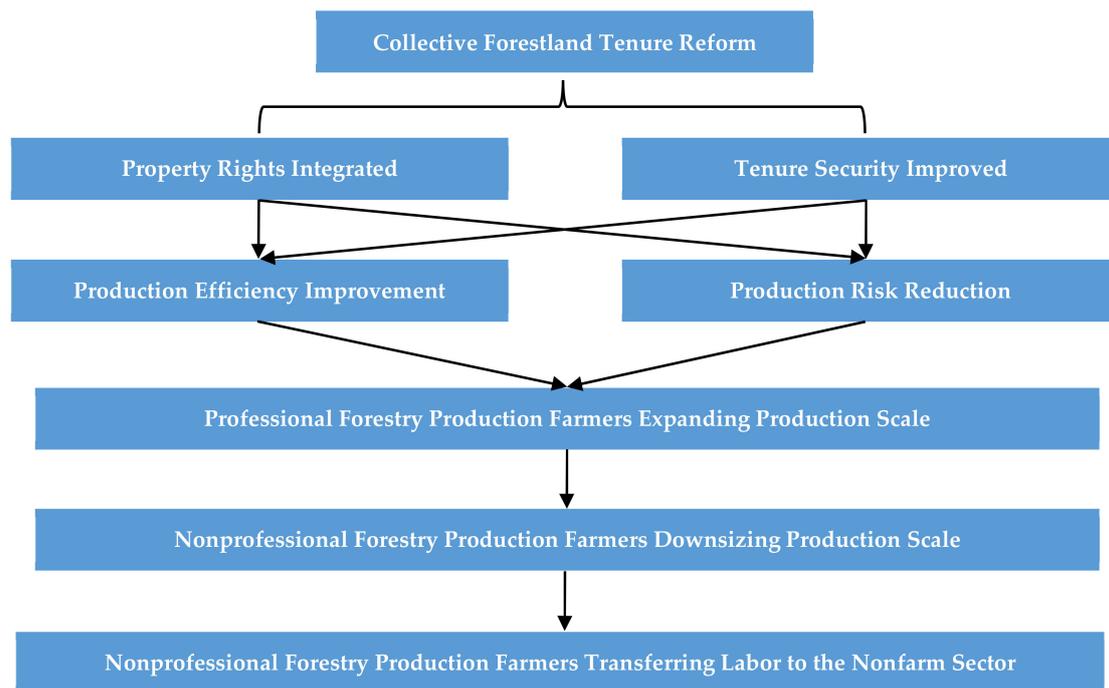
CFTR by adding evidence of its labor transfer effects. We believe that there might be some transferable lessons for policymakers, both within and beyond China, on how to further refine the CFTR.

## 2. Conceptual Framework and Econometric Specification

### 2.1. Conceptual Framework

#### 2.1.1. The Effects of Institutional Arrangements: Tenure Reform Factors

The CFTR has caused the household forestland property rights integrity and forest tenure security to essentially increase [30], which theoretically could stimulate the rural labor force to transfer into the nonfarm sector from forestry production overall. Specifically, on the one hand, the integration of the rights of use, disposition, and beneficiaries of household forestland could increase the households' forestry production efficiency through a reduction in transaction costs and the improvement of production profit [31]. This is because the process of renting out household forestland with property rights certificates would be smoother and incur lower costs. Additionally, the forestry production interests of the lessee can be largely guaranteed by the integrated property rights [32]. Thus, the uncertainty of forestry production also decreases to a large extent from the perspective of the lease and related interest stability [33]. On the other hand, the CFTR stipulates that the integrated property rights of the devolved forestland can last 70 years and be renewed thereafter, which dramatically improves the tenure security of the forestland [34]. This tenure security improvement can also both improve the household forestry production efficiency and reduce the production risks [35]. This is mainly because the secure tenure of forestland can increase the confidence of the investors and reduce unnecessary transaction costs of property rights [36]. Under this investment-friendly institutional environment for property, some farmers with a better endowment to conduct forestry production might be likely to rent forestland from farmers without a comparative advantage for forest production to enlarge their production scale [37]. In this case, those farmers who are enlarging the production scale would tend to be professional forestry production farmers [38]. It is worth noting that, with the forestland rent paid by the professional forestry production farmers, the farmers who lack this capacity would be more likely to rent out their forestland and invest the saved labor into the nonfarm sector [39]. The main reason for this is that the rent from the rented-out forestland plus non-agricultural employment income from the saved labor capital will exceed the original forestry production income [40]. Thus, as a rational-economic man, the nonprofessional forestry farmer would be making a rational choice by downsizing forestry production. Thus, in general, the result is a win-win situation. The nonprofessional forestry farmers could benefit from the total income composed of land rent and non-agricultural employment income, while the professional forestry farmers could increase their total forestry production income because of the realization of economies of scale [41]. The above-mentioned logic influencing the relationships among the associated variables is shown in Figure 1.



**Figure 1.** Conceptual framework: The mechanisms through which the Collective Forestland Tenure Reform affects rural labor transfer.

### 2.1.2. The Effects of Household Characteristics

Household characteristics are one main aspect affecting household labor allocation [42]. These characteristics mainly include household financial capital, the age of the household head, labor size, social network, the education level of the household head, total forestland area, and quality. Households with greater financial capital normally have a larger range of labor investment choices [43]. The age of the household head normally reflects the family life cycle. If the age is older than 60 years, it would be hard for this kind of household to find employment in the nonfarm sector in China [44]. Meanwhile, if the household incorporates a relatively large labor size, it has more labor allocation strategies at its disposal. Better household social network and higher education level of the household head normally can bring more nonfarm employment opportunities to household members [45]. Additionally, abundant and high-quality contracted forestland resources are also a prerequisite for forestry production. If the household's forestland area is relatively small and of inferior quality, the household members theoretically would hold fewer forestry production incentives [46]. Generally speaking, the various characteristics shape rural households' preferences for labor force allocation. Thus, we chose the above-mentioned control variables to more comprehensively explain the influencing factors of farmer household labor allocation strategies under the CFTR.

### 2.1.3. The Effects of Village Characteristics and Geographical Location

The village characteristics and households' geographical location could also affect farmers' labor investment decisions to some extent [15]. Firstly, the distance from the village to the county center is a key value when farmers decide their farm and nonfarm labor investment. For instance, if the village is far away from the county center, it will be relatively difficult and costly to work in the nonfarm sector. Secondly, the extent of villages' rural infrastructure can reflect their economic development level [47]. Normally, villages with a better economy will have a more diverse industrial structure, which can create more employment choices for local farmers [48]. Therefore, from this point of view, the completeness of villages' rural infrastructure can affect household labor investment strategies. Thirdly, village cadres' education level, which can be a measurement variable of village cadres' leadership, wisdom, and ability,

can affect villages' development and economic activities [49]. Thus, the village cadres' education level could play an important role in creating villagers' employment opportunities. Because the specific implementation steps and extent of the CFTR and geographical condition for forestry production vary among provinces [26], we also control for the regions that represent the sampled households to more accurately estimate the impact of the CFTR on rural household labor transfer.

## 2.2. Econometric Strategy

Based on the discussion above, we hypothesize that the representative household probability of labor transfer is explained by property rights integrity, tenure security, household characteristics, village characteristics, and household living region. We used binary probit models to estimate household labor transfer behavioral function. The binary probit model was estimated with the standard maximum likelihood methods and with the assumption that the error terms were normally distributed with a mean of zero [50]. Equation (1) shows the formula for the discrete binary probit model [51].

$$p = p(Y = 1|X) = \Phi(\beta X) \quad (1)$$

This equation estimates the probability of labor transfer occurring for the given observations. In this equation,  $p$  denotes the probability of households conducting labor transfer.  $Y$  is a binary variable, which represents household labor transfer status ( $Y = 1$  for a household labor transfer, and  $Y = 0$  for no labor transfer).  $X$  is the vector of observable characteristics that determine whether  $Y = 1$  or 0 is the suggested outcome of observations. The specific variables are shown in Table 1.  $\Phi$  is the standardized cumulative normal distribution.  $\beta$  is the estimable parameters for outcomes. All the estimations were carried out in Stata version 12.

**Table 1.** Operationalization of variables in the measurement of forest property right integrity and its descriptive statistics.

Property Right Component	Property Right Policy		Property Right Assessment	Mean	Std. Dev.	
	Secondary Indicator	Third-Level Indicator				
Use right	Right to use forestland	Managerial scale of forest land	According to household forestland area from small to large (five levels: less than 1 Ha; 1–3 Ha; 3–5 Ha; 5–7 Ha; more than 7 Ha), 0.2, 0.4, 0.6, 0.8, and 1, respectively	0.56	0.14	
		Managerial term of forest land	0.2, 0.4, 0.6, 0.8, and 1 were assigned respectively according to the forest management term from short to long (less than 10 years, 10–30 years, 30–50 years, 50–70 years, and more than 70 years)	0.53	0.16	
		Independent selection of forest land use	According to the cumulative number of four rights, including forest land converted to agricultural use, forest land converted to other forestry use, independent selection of tree species, and management of non-wood forest products, 0.25, 0.5, 0.75, and 1 were assigned, respectively	0.82	0.42	
		Timber ownership	Without ownership = 0; with ownership = 1	0.73	0.19	
Disposition right	Right to mortgage forests	Required minimum stand age	0.2, 0.6, and 1 were assigned, respectively, according to the timber age from old to young (more than 5 years; more than 1 year; unrestricted)	0.45	0.61	
		Mortgage conditions	Required minimum collateral area of mortgaged forests	According to the required minimum collateral area of mortgaged forests from large to small (four levels: more than 30 Ha; more than 10 Ha; more than 5 Ha; without requirement), 0.25, 0.5, 0.75, and 1, respectively	0.38	0.32
		Constraint of loan limit	Not less than 500,000 yuan = 0; unrestricted = 1	0.02	0.14	
		Collateral rate	According to collateral rate of timber forest from low to high (five levels: 40%; 50%; 60%; 70%; 80%), 0.2, 0.4, 0.6, 0.8, and 1, respectively	0.59	0.45	
		Mortgage content	Loan period	0.25, 0.5, 0.75, and 1 were assigned, respectively, according to the loan term from short to long (3 years, 5 years, 8 years, and 10 years)	0.34	0.23
		Loan interest rate	According to loan interest rate from high to low (five levels: 60%, 50%, 46%, 30%, and 0% higher than benchmark interest rate), 0.2, 0.4, 0.6, 0.8, and 1, respectively	0.45	0.38	

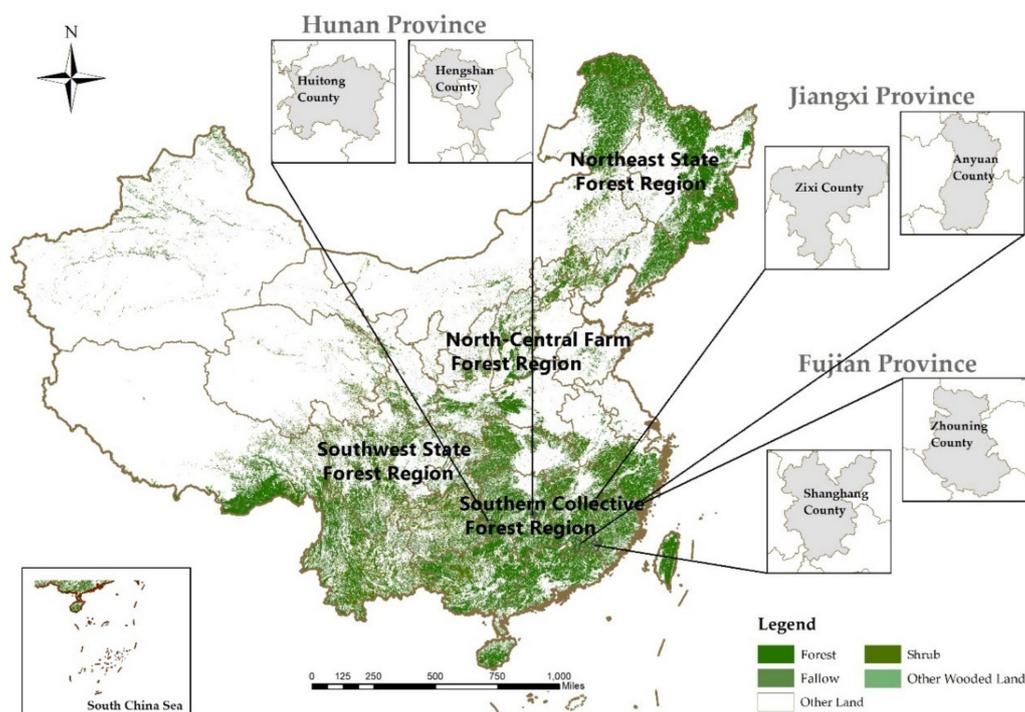
Table 1. Cont.

Property Right Component	Property Right Policy		Property Right Assessment	Mean	Std. Dev.	
	Secondary Indicator	Third-Level Indicator				
Right to harvest timber			If harvest quota is allocated to township government, 0.2; if harvest quota is allocated to villager committee, 0.6; if harvest quota is directly allocated to household, 1	0.31	0.29	
			Does not have the right, 0; has the right, 1	0.89	0.24	
Right to transfer forestland	Allocation level of felling indices		According to the degree of subjective convenience of treading from low to high (five levels: very inconvenient; inconvenient; normal; fairly convenient; very convenient), 0.2, 0.4, 0.6, 0.8, and 1, respectively	0.32	0.31	
Right to inherit ground attachment	With/without circulation right		Does not have the right, 0; has the right, 1	0.83	0.05	
Beneficiary right	Right to market forestry products	Constraint of sales targets	Can only sell forestry products to designated purchasers, 0; without constraint, 1	0.54	0.41	
		Constraint of marketing area	According to available marketing area from small to large (three levels: should not sell products outside local county; can sell products outside local county with additional tax payment; without requirement), 0.2, 0.6, and 1, respectively	0.56	0.31	
	Right to benefit from Forestry production	Forestry taxes and fees	Timber tax and fee burden	According to level of timber tax and fee burden from high to low (three levels: 0–100 yuan/m <sup>3</sup> ; 100–160 yuan/m <sup>3</sup> ; above 160 yuan/m <sup>3</sup> ), 0.2, 0.6, and 1, respectively	0.37	0.15
			Taxes and fees on bamboo and non-timber forests	With taxes and fees, 0; without taxes and fees, 1	0.44	0.30
	Forestry subsidy		Subsidy for afforestation	According to level of subsidy for afforestation from low to high (five levels: without subsidy; 0–300 yuan/ha; 300–450 yuan/ha; 450–900 yuan/ha; 900–1500 yuan/ha), 0.2, 0.4, 0.6, 0.8, and 1, respectively	0.29	0.35
			Subsidy for road construction in forestry area	Without subsidy, 0; with subsidy 1	0.03	0.14

### 3. Data and Empirical Measurements

#### 3.1. Study Area and Data Collection

Based on the ownership of forestland property rights, researchers and governments have normally categorized Chinese forestland into two types: state forestland and collective forestland. State forestland is owned and managed by governments, while collective forestland is owned by the village collective and mostly managed by farmers. As shown in Figure 2, there are four main forestland regions in China: the north-east state forest region, the north-central farm forest region, the south-west state forest region, and the southern collective forest region. The main region where the CFTR occurs is the southern collective forest region. This region accounts for 45.03% of China's overall forestland, and 31.69% of Chinese produced timber comes from this region [7].



**Figure 2.** Forest distribution of China and data collection areas.

To investigate the general condition of China's southern collective forest region, we conducted our survey in Fujian, Jiangxi, and Hunan provinces. The rates of forest coverage of these three provinces are relatively high; the rates are all more than 60%. These three provinces were the pioneers of implementing the CFTR in the collective forest regions. Thus, the effects of the CFTR on household economic behaviors could fully manifest to some extent in these sampled sites. This study employed a simple random sampling method. Specifically, we randomly drew two counties from each of the three provinces, as shown in Figure 2. Then we selected eight towns from each sampled county. In every sampled township, we chose three villages and five households from each selected village. The enumerators used a structured questionnaire to investigate a total of 720 households through face-to-face interviews. This questionnaire covers most aspects of economic and social information for these households, mainly including demographic characteristics, CFTR involvement, forestry production, off-farm employment, and forestland ecological characteristics. China has a strict household registration system, and there is a household head in every household in this system. Normally the household heads, most of whom are older adult men, are the core decision-maker in Chinese families. Thus, to ensure the accuracy of the survey information, we chose the household

heads as our interviewees. After eliminating the unqualified questionnaires, mostly because of outliers and missing values, we acquired 694 valid samples.

### 3.2. Variables Used

#### 3.2.1. Dependent Variable

The dependent variables were qualitative when estimating bivariate probit models. Thus, in this study, we chose the household labor transfer status as our dependent variable. Specifically, in the estimation function, if the number of household nonfarm employment members for whom the cumulative nonfarm workday exceeds 6 months per year generally increased after the CFTR, we assigned a value of 1, and 0 otherwise. We admit that it is very difficult for farmers to accurately count the number of non-agricultural employment days. However, farmers' perception on whether the CFTR could liberate household labor and promote the process of their family members' labor transfer from the farm sector to the nonfarm sector is still worthy of reference. In addition, the farmers' impression on the effects of the CFTR could also reflect the real policy effects to some extent [52]. The hypothesized relationship between the CFTR and household labor transfer behavior can be mathematically tested through the estimation of the function of the probability of household labor transfer occurring for observations.

#### 3.2.2. Measuring Property Rights Integrity

The integrity of property rights refers to the wholeness or the completeness of the bundle of rights [16]. Forestland in the rural areas of China belongs to the village collectives, which means villagers do not have the ownership of their contracted forestland. Thus, in the context of rural China, the forestland property right integrity only includes three main components, which are for forestland use, disposition, and beneficiaries. To comprehensively and precisely measure the strength of these forestland property right components, this study created three property right indexes that employed weighted sums of the scores of corresponding property right policies of each property right component as shown in Table 1. Since farmers' perception and cognition of the improvement of forestland property rights integrity under the tenure reform is the base of their household labor allocation decision, we used the interviewee's cognition on the specific forestry policies on the nine sub-rights in our questionnaire. Table 1 shows the measurement indicators and their descriptive statistics. Because the Delphi method could cause ambiguity in the weights of forestland property right components, we employed the entropy method to calculate the weights [53]. The specific calculation method was as follows: (1) build a matrix as  $R = (r_{ij})_{m \times n}$ , where  $r_{ij}$  is the right policy  $j$  of household  $i$ ,  $m$  is the number of observations in the sample, and  $n$  is the number of right policies of each property right component; (2) calculate the entropy of each right policy,  $H_j = -k \sum_{i=1}^m f_{ij} \ln f_{ij}$ , where  $f_{ij} = \frac{r_{ij}}{\sum_{i=1}^m r_{ij}}$  and  $k = \frac{1}{\ln m}$ ; (3) calculate the entropy weight of each right policy,  $g_j = \frac{1-H_j}{m-\sum_{j=1}^n H_j}$ , and then standardize it. Based on the entropy weight, we calculated the property right indexes of the right components [54].

#### 3.2.3. Measuring Tenure Security

Categorizing forestland tenure security into three types—legal tenure security, actual tenure security, and perceived tenure security—is widely recognized by most scholars. From the perspective of the institution of law, the tenure security of the devolved forestland after the CFTR is stable and sufficient [26,30]. However, it is households' impression and perception on the forestland tenure security that mainly matters in households' actual labor investment decisions instead of the legal tenure security [6]. Households' perception and expectation on the forestland tenure security mainly comes from their experienced reallocation and expropriation process in China [55]. This is because the government always legally holds the right to expropriate land for some reasonable reasons, like environmental protection or governmental construction. On the other hand, the village committees

have the right to reallocate forestland among villagers. Besides, it is worth noting that farmers' perceived risk of their forestland being reallocated and expropriated is the core factor that diminishes their marginal willingness to engage in forestry investment. Thus, this study mainly uses households' expectation of the possibility of their forestland being reallocated and expropriated to indirectly measure the tenure security [43]. Specifically, if the households' perception of the possibility of forestland reallocation and expropriation significantly exists, we assigned a value of 1, and 0 otherwise.

## 4. Results

### 4.1. Descriptive Statistics

Among our sampled households, 83.56% are involved with nonfarm employment and 68.21% have a certain proportion of forestry income. In addition, the average proportion of sample farmers' forestry income to total income was 16.28%. Following the CFTR, 98.21% of the households acquired the newly devolved forestland from their village committees and 96.57% were issued forestland property right certificates for both their originally owned and newly acquired forestland. However, a small proportion of farmers still do not have awareness of the primary reform aim and content, not to mention having an understanding of how they should react to the CFTR. This phenomenon suggests that in some villages, the implementation of CFTR does not reflect standardized requirements. Fortunately, although the frequency of China's forestland reallocation and expropriation was relatively high before the CFTR, the sampled household heads' expectation of the risk of their forestland being reallocated and expropriated is relatively low. The mean value of the variable of reallocation perception and expropriation perception could suggest this reality to some extent. Both average values are under 0.5. It is also necessary to mention that the average age of household heads is 58.84 years, which means that the family life cycle is relatively old. The primary reason is that with current urbanization, most young villagers now usually work in cities and mainly rely on nonfarm income. Additionally, the average total forestland area of the sampled households is 7.86 Ha, which suggests that the households living in the southern collective have a relatively rich endowment of forestry resources. Table 2 shows the definitions and descriptive statistics of the variables involved in our empirical models.

**Table 2.** Descriptive statistics of the data ( $N = 694$ ).

Variable	Definition	Unit	Mean	Std. Dev.
<i>Rural Labor Transfer</i>				
Household Labor Transfer	Whether household's number of cumulative nonfarm workdays exceeding 6 months has increased	0/1	0.68	0.33
<i>Property Rights Integrity</i>				
Use Right	Strength of the bundle of the rural household's right to use forest land and ground attachment	/	0.65	0.38
Disposition Right	Strength of the bundle of the rural household's right to dispose of forest land and ground attachment	/	0.61	0.31
Beneficiary Right	Strength of the bundle of the rural household's right to benefit from forest land and ground attachment	/	0.32	0.36
<i>Tenure Security</i>				
Reallocation Perception	Household's perception of the possibility of forestland reallocation after the expiry of contracts	0/1	0.38	0.52
Expropriation Perception	Household's perception of the possibility of forestland expropriation in the next 10 years	0/1	0.49	0.47

Table 2. Cont.

Variable	Definition	Unit	Mean	Std. Dev.
<i>Household Characteristics</i>				
Financial Capital	Total household deposit	Yuan	88,984.28	82,362.93
Age	Age of household head	Year	58.84	82.12
Labor Size	Number of working persons in household	Person	3.06	0.28
Social Network	Household's number of ways to find nonfarm employment	/	3.81	0.34
Education	Cumulative years of schooling for head of household	Year	6.51	3.39
Total Forestland Area	Total forestland(s) area managed by household since the CFTR	Ha	7.86	10.92
Forestland Quality	Household's assessment of the overall external environmental condition of forestland, such as geomorphic, climate, soil, hydrological, and biological conditions	5-point Likert Scale	3.01	2.04
<i>Village Characteristics</i>				
Distance	Distance to county center	Km	38.56	22.81
Rural Infrastructure	Number of buses	/	3.21	0.58
Education of Village Cadre	Years of education of the village cadre	Year	8.65	4.89
<i>Region</i>				
Fujian	Whether a household's registered permanent residence is in Fujian province	0/1	0.29	0.52
Jiangxi	Whether a household's registered permanent residence is in Jiangxi province	0/1	0.33	0.49

#### 4.2. Estimation Results

By using the household income share from forestry, we divided our observations into two sample subsets. We defined the households for which forestry income accounts for more than 50% of household total income as forestry-dominated observations and the remaining samples as non-forestry-dominated observations. Since forestry-dominated and non-forestry-dominated observations might make contrary decisions in the face of CFTR, this study used three sample sets—all observations, forestry-dominated observations, and non-forestry-dominated observations—to estimate the binary probit models. We will illustrate the results of each model and especially compare the effects of property rights and tenure security among the three sample sets as follows.

##### 4.2.1. The Effects of Property Rights

As shown in Table 3, the household forestland rights for use, disposition, and beneficiaries all had a significantly positive effect on household labor transfer. This result sufficiently supports our theoretical hypotheses. It is apparent that the CFTR did promote forestland resource integration and rural labor resource flow to the nonfarm sector. However, these motivating effects in the group of all observations and forestry-dominated observations were more significant than those of non-forestry-dominated observations. The reason might be that the non-forestry-dominated observations do not heavily rely on forestry income and would have a lower reaction to the reform policies. Interestingly, among the three types of forestland property rights, the effects of the use right were the weakest. The reason might be that offering farmers a use right to conduct forestry production is not the most effective way to motivate forestry-dominated farmers to enlarge their forestry labor investment strength. Instead, the disposition right and the beneficiary right can protect forestry production profits from artificial losses and improve the freedom to extract cash profit from forestry production resources.

**Table 3.** Estimation results: Binary probit models for the probability of household labor transfer.

Independent Variable	All Observations		Forestry-Dominated Observations		Non-Forestry-Dominated Observations	
	Coefficient	Z-Statistic	Coefficient	Z-Statistic	Coefficient	Z-Statistic
Use Right	0.719 ***	4.61	0.475 **	2.24	0.645 *	1.83
Disposition Right	1.105 ***	7.71	1.193 ***	7.18	1.796 ***	6.49
Beneficiary Right	0.355 ***	3.58	0.674 ***	4.28	0.725 ***	2.72
Reallocation Perception	−0.167 ***	−2.94	−0.230 ***	−3.08	−0.435 ***	−3.03
Expropriation Perception	−0.062 **	−2.26	−0.064 **	−2.33	−0.070	−1.33
Financial Capital	0.111 ***	3.67	0.122 ***	3.64	0.118 **	2.33
Age	−0.046 *	−1.95	−0.050	−1.99	−0.049	−1.55
Labor Size	0.029 ***	5.01	0.039 ***	5.08	0.035 ***	2.73
Social Network	0.001	0.87	0.001	1.10	−0.001	−0.79
Education	0.027 ***	4.66	0.030 ***	4.42	0.021 **	2.45
Total Forestland Area	−0.087	−0.80	0.074	0.56	0.043	0.22
Forestland Quality	−0.004	−0.04	0.048	0.43	0.148	0.82
Distance	−0.033	−1.04	−0.037	−1.04	2.271 **	2.16
Rural Infrastructure	−0.010	−1.36	−0.010	−1.41	0.012	0.37
Education of Village Cadre	0.001	1.05	0.001	0.85	0.001	0.04
Fujian	−0.126	−0.25	0.120	0.22	0.375	0.39
Jiangxi	0.106	0.38	−0.023	−0.07	0.166	0.33
Constant	−4.444	−3.46	−5.635 ***	−3.76	−7.031	−1.65
Statistics Diagnosis						
Chi-squared		254.19		213.15		156.18
Log Lik.		−349.56		−214.10		−77.64
Pseudo R <sup>2</sup>		0.267		0.332		0.501
N		694		465		229

Note: \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.

#### 4.2.2. The Effects of Tenure Security

The estimation results show that households' forestland reallocation perception could significantly and negatively affect the possibility of labor transfer. This suggests that the forestland property rights risk of reallocation could largely undermine farmers' labor transfer strength. Meanwhile, households' forestland expropriation perception is negatively associated with households' labor transfer possibility; however, the negatively association is only in the estimation subgroups of all observations and forestry-dominated observations. This result reveals that farmers in these two subgroups would have a lower tendency to enlarge their forestry investment scale when they face the risk of expropriation of their forestland. However, the non-forestry-dominated households' perception on forestland expropriation had no significant relationship with their labor transfer possibility. Considering China's specific situation, forestland constitutes a considerable aspect of farmers' social security, especially when they face the risk of unemployment. Thus, forestry-dominated households would not tend to rent forestland from non-forestry-dominated households if they perceived a high risk of forestland expropriation, and vice versa. However, this influence relationship might not exist with any significance among farmers who take nonfarm income as the main source of their household income. Although facing the risk of tenure security might cause some households seek other alternative safer employment with better incomes, more farmers might keep work on their forestland under this kind of uncertainty, as the regression results show.

#### 4.2.3. Other Determinants of Household Labor Transfer

Among the variables featuring household characteristics, financial capital and education background are positively and significantly related to their labor transfer possibility. This result suggests that households with both better financial and educational capital have a higher tendency to conduct labor transfer. Similarly, the positive and significant coefficient between household labor size and labor transfer possibility indicates that households' with relatively rich labor resources tend to have more members working in the nonfarm sector. By contrast, household social network, total forestland

area, forestland quality, rural infrastructure, education of village cadre, and region variables were all found to be insignificant with household labor transfer possibility. This indicates that households might not take these factors into consideration when they make household labor allocation decisions. Thus, we could conclude that, relative to these insignificant influencing factors, changes in the institutional and property rights conditions of household forestry production brought about by the tenure reform are more able to adjust the household labor resource allocation behavior.

## 5. Discussion

Urbanization has been happening on a large scale in China for about the last 40 years, and this process has sped up in the last 10 years [56]. Besides more and more graduates finding employment in cities, farmers' labor transfer from the agriculture to the nonfarm sector is also a crucial part of China's urbanization impetus. Farmland and forestland resource reintegration and realized scale production theoretically might be one of the most vital reasons that labor resources have been continuously released from the agriculture sector. That farmland resource reintegration motivates agriculture labor transfer into the non-agricultural sector has been demonstrated by many scholars [57]. Theoretically, forestland transfer among households could help forestry production farmers achieve economies of scale through adjusting the mismatched labor–land structure, which is rather beneficial for forestland-use efficiency [24]. However, the labor transfer effect of forestland resource reintegration under the CFTR has barely been researched. Thus, this study tried to fill this knowledge gap. Some studies that have used Chinese survey data have revealed the relationship between the CFTR and household forestland transfer and have concluded that the CFTR does motivate farmers to conduct forestland transfer [23]. These previous studies offer a rather solid research foundation for our study because they have at least demonstrated that the CFTR has helped farmers achieve forestland reintegration to some extent [8]. This reality is the actual basis of our theoretical analysis.

The most significant academic and practical value of our study is that we try to reveal the effects of forestland property right bundles and tenure security on household labor transfer from the farm to the nonfarm sector. One research innovation is that we systematically measure the improved forestland property rights through creating indexes of rights. The original measurement variables of these indexes are specifically categorized forestland property right policies [13,58]. This kind of methodology could guarantee the measurement accuracy of these indexes in the context of large differences in forestry property rights policies across regions. Through the above-mentioned property rights index creating process, we could precisely and, more importantly, integrally measure forestland property rights under the CFTR. This allowed us to compare the property rights across different sampled regions and to determine the effect of each specific property right component. Previous studies have usually used a simple dummy variable, which is whether the household possesses a certificate of forestland, to measure the implementation of the CFTR. This would lead to serious measurement biases and information leakage problems.

Additionally, in previous studies that have evaluated the performance of the CFTR, scholars have barely taken forestland tenure security into consideration [12]. Since farmers' perception and cognition on forestland tenure security could affect their forestry production investment decisions and household labor allocation strategies, it is important and necessary to incorporate the tenure security variable into our empirical models. There are two ways to measure tenure security: objective and subjective measurement [3]. Although objective measurement can be more precise, it is the farmers' subjective perception on tenure security that really matters when they are making forestry investment and labor allocation decisions. Therefore, this study employed the subjective measurement method, which could enhance the rationality of our research results.

The most important policy implication for China and elsewhere according to our research results is that policymakers should try their best to empower farmers with complete property right integrity and stable tenure security. This kind of institutional arrangement would safeguard farmers' forestry production profits, and, then, motivate households to enlarge their forestry production scale, which

might help to increase the allocative efficiency of the rural forestry production resources. Additionally, the government is advised to maintain forestry policy stability and consistency, so that stakeholders could generate a relatively stable and more sufficient profit expectation [59]. Moreover, policy inconsistencies, which happen frequently in China's regional forestry policies, should be removed to improve local bureaus' management efficiency [13,34]. The idleness of farmland and woodland resources caused by rapid urbanization is the most serious current problem in Chinese rural areas. The average age of the main people engaged in agricultural production in rural China is around 60 years old, and it is very hard for them to find the relay of their children to conduct their small farm production because of the relatively low and insufficient income for a household. Thus, after the generation who now are dominant in agricultural production disappears, the farmland idle problem would become more serious in the foreseeable medium-term. Thus, there is an urgent need to address this challenge in a timely manner.

China's southern collective forest region covers ten provinces. However, because of our limited research resources, we acquired only 694 qualified samples from three of these provinces. This relatively small sample size reduces the credibility of the research results. Thus, if we can diversify our investigational areas and enlarge our sample size, a future study might reveal more underlying relationships between the CFTR and household labor allocation. Chinese rural household labor transfer depends on a large variety of variables. Unfortunately, it is rather hard to include too many independent variables in our models. As a result, this missing independent variable issue will cause endogeneity problems and undermine the validity of our empirical models. Thus, to solve this problem, future studies should incorporate more variables of theoretical influence on Chinese rural household labor transfer into the models.

## 6. Conclusions

In the context of China's Collective Forestland Tenure Reform (CFTR), building on recent research advances, this study makes efforts to reveal the theoretical relationship between the CFTR and rural household labor transfer by employing binary probit models, using rural household survey data from three provinces located in the southern collective region of China. The most significant result of our research is that the CFTR motivated rural household labor transfer from the agriculture sector to the nonfarm sector. It is worth noting that the improved forestland rights for usage, disposition, and beneficiaries under the CFTR all can effectively stimulate the labor transfer process. In addition, we find that refined forestland tenure security plays a significant role in motivating rural household labor transfer. The fundamental underlying logic of these influence relationships is that the implementation of the CFTR enables households to effectively transfer and integrate rural forestland resources. As a result, the utilization efficiency of rural forestland and labor resources has been improved dramatically. This finally led to the non-agricultural transfer of surplus rural labor. With regard to practice, this paper attempts to further elucidate practical solutions to help local governments effectively promote the transfer and liberation of rural labor. From this point of view, according to the results of our study, governments at all levels should better maintain the integrity of forestland property rights and the stability of forestry policies. However, notwithstanding the fact that there is robust and scientific theoretic analysis based on our conceptual framework, our empirical results could only reveal the correlation between independent and dependent variables but not the causation. Thus, to improve the robustness of this line of research, it is necessary to build a panel database so that we can estimate more sophisticated models in further studies. Additionally, it is also necessary to measure the quantitative strength of the influence of the different forestland property bundles on rural households' labor transfer in the next stage of research.

**Author Contributions:** L.Y. and Y.R. conceived and designed the study; L.Y. and Y.R. performed the data collection; L.Y. analyzed the data; Y.R. wrote the manuscript; L.Y. commented on and revised the manuscript. All authors have read and agreed to the published version of the manuscript.

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