Household Income Growth, Diversification and the Implicit Costs of Reform:
The Case of China's State Forest Sector

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I. INTRODUCTION

As with other components of its receding planned economy, China's state forestry sector faces growing pressure to reform, restructure and liberalize, with policymakers considering the tradeoffs between the shorter-term social welfare impacts versus the longer-term goals of economic and environmental sustainability. Timber production for the state sector is conducted primarily by state forest bureaus, which are huge state-owned enterprises often serving as key economic and political actors in the regions where they operate. Set up in the 1950s to harvest the nationalized natural forests in the northeast and southwest, these bureaus each manage hundreds of thousands of hectares of forest area and employed upwards of a million workers throughout the 1980s and 1990s (Yin, 1998; ZGLYTJNJ, various years).[1] State forest bureaus currently manage 17% of China's total forested area, containing 24% of the country's total forest volume. (Note: all forests managed by SFB are classified as natural forests, about half of China's total natural forests.) Furthermore, as with other state-owned enterprises these bureaus have been responsible for providing most social services for the communities they support, many of which came into existence due to the establishment of these bureaus. As such, reforms to this sector have important implications for both natural resource management and human welfare in China.

Up through the late-1980s to mid-1990s, the revenues generated from timber production and processing from natural forests have generally been sufficient to cover the operating expenses and social welfare responsibilities of these bureaus, in many cases via unsustainable harvesting practices (Xu *et al.*, 2007). However, by the mid-1980s the results of these practices were being felt, and pressure to reform China's state-owned forestry sector began to mount due to what State Forestry Administration (SFA) leaders called the "two crises": ecological degradation and economic loss-making. Despite these concerns, substantive reforms to the state forestry sector did not begin until 1998; severe floods in that year, suspected to have been caused or exacerbated by over-logging in state forestry areas, pushed SFA leaders to implement the Natural Forest Protection Program. Under it, state forest

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[1] This is counting only the 135 state forest bureaus concerned with timber harvesting.

bureaus face strict logging quotas and have been given subsidies and performance targets in terms of afforestation/reforestation and forest conservation activities. Bureaus have also been expected to thin and restructure their labor force away from harvesting and processing towards afforestation/reforestation, conservation and forest management activities; official sources indicate that more than a third of the workforce has been permanently released as part of the program (ZGLYTJNJ, 2004).

Although the NFPP has involved significant restructuring of the state forestry sector labor force, SFA leaders have been loath to conduct more substantive reforms, and the centralized system of management and finance remains in place. This has been due largely to concerns about the impact that further reforms would have on the livelihoods of local communities and households dependent on forest bureaus. These concerns have been accentuated, furthermore, by significant informational asymmetries that exist between forest bureaus and the SFA. Forest bureaus have used this to press for continuation of subsidies, based on arguments that reform and privatization will result in significant adverse human welfare impacts. Thus, lack of information on how important state forest bureau income is for bureau workers and households has limited SFA leaders' ability to gauge the true costs of continued reform. Understanding the changes that have taken place in household income structure and dependence on the state forestry sector over the past several years, and particularly within the context of the dramatic changes brought about by the Natural Forest Protection Program, would provide policymakers with valuable insights into the relative costs of decentralization and privatization of the state forestry sector.

Using a 2005 household survey, this paper helps to fill this gap by providing a detailed, descriptive analysis of the changes in average per-capita income, its composition and distribution for the population of households dependent on state forest bureaus in the three key northeastern provinces of Heilongjiang, Jilin and Inner Mongolia. Contrary to the concerns of SFA leaders, we find that household dependence on state forestry bureaus has declined during the NFPP; average per-capita income for this population of households has improved and households have been able to successfully diversify their income sources into

both agricultural activities and the off-farm wage sector. At the same time, however, significant variation in these patterns both regionally and in terms of household type suggests that further reforms will need to be accompanied by a package of subsidies and incentives targeted at vulnerable households and communities to reduce potential adverse welfare impacts of restructuring. The remainder of the paper is organized as follows. Section I provides background regarding the Natural Forest Protection Program and the reform process of the state forestry sector. Section II then uses the survey data to provide a descriptive analysis of the changes that have taken place in household income composition and source dependence. Section III provides estimates of the distributional changes that have occurred, decomposed by region, household type and income source. Section IV concludes.

II. REFORMING CHINA'S STATE FOREST BUREAUS

China's State Forestry Administration leaders have been debating reform of the state forestry sector since the mid-1980s, when the economic and environmental sustainability of the system emerged as a key concern. A central issue has been how best to restructure state forest bureaus to more effectively manage and utilize the forests under their care, while at the same time reducing the human welfare impacts of such restructuring. Like other state-owned enterprises, forest bureaus are responsible for providing almost all social services to their workers and their families, including health care, public safety, education, retirement and social welfare (Yin, 1998). Since timber production has been the major or only source of revenue for these bureaus, the burden of these responsibilities has inevitably led to over-harvesting. These impacts on forest resources have been further exacerbated by the increase in human populations in or near natural forest areas accompanying the development of forest bureaus (Xu *et al.*, 2007).

Albers *et al.* (1998) estimates that timber was harvested during the 1980s at unsustainable rates in the three key provinces of the state-owned forestry sector – Heilongjiang, Jilin and Inner Mongolia; while total timber forest area in these provinces decreased by 0.5% and timber volume by 4.7% from 1980 to 1988, mature timber forest area and volume decreased

by fully 20.7% and 20.2%, respectively. Furthermore, volume of mixed broadleaved forests decreased by more than half and that of fuelwood forests by almost 90% during this time period, suggesting a significant reduction in the ecological services provided by these forests. As recently as 1997, as much as 98% of the 18.8 million m^3 produced by state forest bureaus was from natural forests (Xu *et al.*, 2007). As a result, though Heilongjiang, eastern Inner Mongolia and Jilin provinces remain China's key suppliers of timber, most accessible areas have been logged and, consequently, many of the commercially viable stands have been exhausted (Yin, 1998). Related to this, China's domestic wood production rates have been declining since 1995 (Zhu *et al.*, 2004).

Despite these trends, however, it took devastating floods in the Yangtze River Basin and Northeast China in 1998 to precipitate government response.[2] Concerns that continuous over-logging and consequent significant deforestation in state-owned forest areas was an important factor behind the severity of the floods pushed leaders to implement the Natural Forest Protection Program (NFPP) in the same year. Also known as the "logging ban", the NFPP is one of the six major forestry programs of China's State Forestry Administration.[3] Under it, state forest bureaus face strict logging quotas, and have been provided a package of subsidies and targets to restructure forest bureau activity towards greater emphasis on afforestation/reforestation, conservation and forest management. Logging has been completely banned in southwest state forest areas and in the upper watershed of the Yellow River basin, while substantially curtailed in the northeast and elsewhere in order to protect 33 million ha of predominantly old-growth forests. As initially conceived, the NFPP was to reduce roundwood production in these areas from 18.54 million m^3 in 1997 to 11.02 million m^3 in 2003, and overall commercial timber harvests from 32 million m^3 in 1997 to 12 million m^3 by 2003. The program also aims to conserve around 90 million ha of natural forests, and

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[2] The floods during the summer of 1998 occurred in the Yangtze River Basin and the Songhua and Nen rivers in Northeast China, claimed 3,000-4,000 lives and caused more than US$12 billion in damages and lost production, including the loss of some 5 million hectares of crops (Zhu *et al.*, 2004; Lu *et al.*, 2002; CIFOR, 2004).

[3] The other programs are the Sloping Land Conversion Program, the Key Shelterbelt Development Program in north China and the middle and lower reaches of the Yangtze River (aimed at combating desertification and protecting watersheds and coastal regions), the Beijing and Tianjin Sandstorm Source Control Program, the Wildlife Conservation and Nature Reserve Development Program, and the Fast-Growing High-Yield Plantation Development Program (Xu *et al.*, 2007; SFA, 2005; Zhu *et al.*, 2004).

to afforest/reforest an additional 30.97 million ha by 2010 via mountain closure, aerial seeding and artificial planting (Xu *et al.*, 2007).

The central government invested some RMB22.26 billion (US$2.69 billion) in the NFPP from 1998 to 2000, and in its formal approval of the NFPP in 2000 the state council plans to spend RMB96.2 billion (US$11.63) over the next ten years (Liu, 2002; SFA,2002). Of this, 81.5% would be allocated by the central government for these tasks, with the remaining RMB17.8 billion coming from the involved provinces. Many of these expenditures are in the form of subsidies to the state forest bureaus, allocated as follows: forest regeneration via mountain closure, RMB1,050/ha; aerial seeding, RMB750/ha; artificial planting, RMB3,000/ha in the Yangtze River basin and RMB4,500/ha in the Yellow River basin; and forest protection, RMB10,000/worker/340has. Bureaus have also had to significantly thin and restructure their labor force under the program, and since the start of the NFPP have been releasing redundant laborers with one-time settlements, with average settlements of about RMB20,000 per worker (ZGLYTJNJ, various years). As detailed in Table 1 below, by 2004 a total of 208,439 workers have been laid off under the NFPP, while some 62,374 workers remain idle and a further 261,642 have left the forest bureaus while still retaining worker status.

[Table 1]

Given the significant changes brought about by the program, the NFPP has constituted an important moratorium on the state forest sector system. However, SFA leaders remain hesitant to push reforms further, due in part to concerns that the social and political costs would be prohibitive. To date, the NFPP has resulted in significant restructuring of the workforce of forest bureaus. Figure 1 below presents estimates of change in total workforce and workforce structure for a 2005 household survey from 24 bureaus in the three key provinces of Heilongjiang, Jilin and Inner Mongolia. It is estimated that these forest bureaus have significantly reduced their labor force since 1997, while restructuring it somewhat according to the goals of the NFPP. Total labor force (measured in full-time equivalent workers) dropped by almost 50% between 1997 and 2004. At the same time, the share of total

workforce engaged in the more traditional timber-production and processing activities has dropped; transportation dropped from 6.4% to 5.2%, harvesting from 3.2% to 3%, and industry from 21.4% to 15.7% in 1997 and 2004, respectively. Conversely, conservation and forest management increased from 3.7% to 5.3%, and silviculture from 3.4% to 3.8% in 1997 to 2004, respectively.

[Figure 1]

As detailed in Table 1, forest bureaus still employed 553,319 workers in the timber industry in 2004, more than one third of the total workforce in China's state forestry sector (ZGLYTJNJ, 2004). Taking into account the families of workers, these bureaus are responsible for the welfare of over 2.6 million people. As such, local communities and governments have put significant pressure on forest bureaus to restrict further restructuring due to fears of the economic repercussions of further large-scale lay-offs. Indeed, some evidence supports this; Lebedys (2000) finds that though China accounted for 24% of global forestry sector employment in 2000, gross value-added per laborer in the sector is quite low compared to other countries, suggesting that if bureaus were to continue shedding workers in accordance with economic efficiency criteria a significant share of the remaining workforce might also be released.

III. STATE FOREST BUREAU HOUSEHOLD INCOME COMPOSITION AND SOURCE DEPENDENCE

Given this backdrop, it is clear that critical to gauging what options are available for further reform is understanding how the livelihoods of forest bureau workers and their families have changed during the NFPP, and particularly in the three key northeastern provinces of Heilongjiang, Jilin and Inner Mongolia. As seen from Table 1, in 2004 these three provinces alone accounted for 83% of the labor force of state forest bureaus, and 31% of the labor force in the state forestry sector overall. These provinces also contain 75 of China's total 135 state forest bureaus involved in timber production, with these managing 67% of total state forest

bureau forested land.[4] Furthermore, as detailed in Figure 1, households in these provinces have already been subject to the significant labor force restructuring, and thus examining shifts in the their income structure and income distribution over the course of the NFPP will provide insights into the potential welfare impacts of further reform.

To do this, we use a 2005 survey of forest bureau households (households whose work unit is a state forest bureau) in these three provinces, conducted by the Center for Chinese Agricultural Policy, Chinese Academic of Sciences. The survey collected detailed information from 24 forest bureaus, 72 forest farms within the bureaus (3 farms in each bureau) and 1,455 forest bureau households. Forest farms are sub-units of forest bureaus – analogous to production units of the receding planned economy – responsible for harvesting, forest management and silvicultural activities, and contain around 200 households on average, ranging within our sample from 1221 to 18. The forest bureaus in the sample have on average 13 forest farms, ranging from 3 to 26. These forest bureaus were selected to capture a range of institutional histories, scales of operation and management types. They employed 158,725 workers and managed 5.34 million ha of forested area in 2004, roughly 34% and 28% of the workers and forested area, respectively, of state forest bureaus in Northeast China, and 29% and 19% of the workers and forested area of state forest bureaus in all of China (ZGLYTJNJ, 2004). Three forest farms were randomly selected per forest bureau, and about 10 households were sampled per forest farm. These households have the semi-informal designation within China's state forestry system as being "mountain-top" (*shanshang*) – which denotes households that work in harvesting, transportation and silviculture. Around 30 additional households were sampled per forest bureau from the population that generally works in administration, support, processing and other industries. These are, similarly, designated as "mountain-base" (*shanxia*).

The distinction between *shanxia* versus *shanshang* household status is an important one. In addition to types of work, these household types also differ substantially in terms of residency.

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[4] In the 1980s, the state managed over 91% of the forests in these three provinces (Albers *et al*., 1998).

As the names imply, "mountain-top" (*shanshang*) households generally live in more remote, rural areas where forest farms are located, close to important forest resources. These households are directly associated via residency permit (*hukou*) with their respective forest farms. Conversely, "mountain-base" (*shanxia*) households tend to be located in the more developed areas where processing and administrative activities are centered, and they are more broadly associated with the forest bureau at large, with their residency permits managed by community committees associated with particular urban areas. Thus, through both location and status, these household types connote different degrees of access to different sets of productive resources; mountain-top households tend to have greater access to agricultural land and forest area, whereas mountain-base households generally have greater access to forest bureau administrative and financial resources, and generally to the urban job market. Though these two household types still share the same formal work status, the growing administrative demands of forest bureaus have resulted in this increasingly important diversification since the 1980s.[5] As will be seen in the results of the survey, the differences between these household types translate into important distinctions regarding structure and distribution of household income.

To gain insights into both changes in general welfare and the ability of households to adapt to restructuring, we focus on both individual-level measures of per-capita income and household-level measures of income diversification and source dependence. In particular, per capita income is calculated for the general population (whereby the per-capita household income data is re-weighted to estimate the general per-capita income distribution), since this is the most appropriate measure to use for examining inequality and welfare in the general population (Deaton, 1997). Conversely, household-level measures such as income diversification and household income source dependence are calculated with household-level weights. To focus on general trends, households in the upper and lower 1.25% of the income distribution in each year were trimmed from the sample.[6] Income is divided into eleven

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[5] Based on the survey sample, anywhere from between 7% to 54% of the household population in a given forest bureau is *shanshang*.

[6] Those dropped from the sample have per capita net incomes at the low end ranging from -RMB3,040 to RMB198 in 1997 and from -RMB18,668 to RMB145 in 2004, and at the high end ranging from RMB9,315 to

components: 1) state forest bureau wage, 2) pension and 3) subsidy income, 4) non-state off-farm work, 5) sales and rental of fixed and productive assets, 6) net cropping, 7) net husbandry, 8) net non-timber forest product (NTFP) income, 9) fuelwood collection, 10) gifts, support from relatives & remittances and 11) other.[7] Subsidy income includes central government payments, as well as stipends for living expenses and in some instances basic welfare provisions by forest bureaus and forest farms. Non-state off-farm work includes both wage work and self-employment. Agricultural and NTFP incomes are net of input costs. Fuelwood income is calculated from total fuelwood collected, valued at average regional prices from sales, as calculated from the household survey data. Sales and rental of fixed or productive assets includes rental of land, equipment or building space, sales of housing or vehicles or sales of other durable goods.

Non-timber forest product (NTFP) income is defined as that coming from a range of herbs, fungi, fruits and vegetables that can be collected naturally in the local forests, but which might also be cultivated. Whether cultivated or collected, these are defined as NTFPs based on the assumption that forest ecosystems are important inputs to production. For example, numerous households in the sample produced "tree-ear" mushrooms, a common ingredient in Chinese cuisine, both via collection in nearby forests as well as cultivation on plots adjacent to or within forests. Survey households similarly collected in forests and/or cultivated a number of other herbs, fruits, nuts, vegetables and fungi commonly used in Chinese cuisine and traditional medicine.

Table 2 below presents estimates of average household characteristics and average per capita net income and income components for each of these populations. In terms of household characteristics, mountain-base households have higher maximum age and maximum years of

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RMB37,091 in 1997, and from RMB21,652 to RMB98,993 in 2004. Very low or negative net incomes were generally due to large investments in agricultural or husbandry activities. High net incomes were generally due to large wage (both forest bureau and non-state sector) or agricultural incomes.

[7] Cropping, husbandry and NTFP income is net of input costs. All agricultural and forestry-related income includes own consumption, which is valued using average market prices calculated from the survey. The category of "other" is a combination of lottery income and entries in the category of "other income" in the survey for which no description was given by households. Pension income also includes compensation for injury or death, though this is an insignificant component.

education in both years, significant at 0.1%. This is not surprising, given their selection to work in administration and management. The number of labor age adults is not significantly different between the two household types in either year, while household population is only significantly different in 1997 and household average age is only significantly different in 2004 (both at 5%). The results from Table 2 indicate that while average income for both household populations has increased during 1997-2004, striking distinctions exist between the two in terms of rates of growth and income composition. The most apparent is that the average growth rate of per capita income in 1997-2004 for the mountain-top population was fully 130.3%, as compared to 79.2% for the mountain-base population, with this being significantly different at 0.5%. This implies average annual growth rates of 8.7% and 12.7% for mountain-base and mountain-top populations, respectively.

[Table 2]

Related to this, a second important distinction is the difference in income composition and its contribution to growth. For the mountain-base population, 50.5% of the increase in average per capita income actually comes from forest bureau sources, with 41.6% coming from growth in pension income alone. The second largest contributor is the off-farm non-state sector, which accounts for fully 32.2% of growth in average income. For mountain-top population, the majority of the increase in average income comes from non-state sources; almost 20% comes from increase in non-timber forest products (NTFPs) income, 22% comes from non-state off-farm work, and 18.8% comes from increase in cropping, husbandry and aquaculture income. In fact, these sectors alone comprised 60.6% of growth in average per capita income for the mountain-top population, as compared to only around 34.6% for mountain-base. It is also important to note that both population types have benefited significantly from growth in the off-farm wage sector; average per-capita off-farm wage income grew 165% for the mountain-base population and 173% for the mountain-top. It is also interesting to note that a non-trivial share of average per-capita income growth – 8.9% for mountain-base and 6.6% for mountain-top populations – has come from migratory work (outside of forest bureau areas) in the off-farm non-state sector.

Table 3 below looks at changes in income diversification and household dependence on state forest bureaus. Evidence of the labor-force restructuring involved in the NFPP can be clearly seen in the significant reduction in dependence on forest bureau wage labor for both household populations. In particular, the share of mountain-base households dependent on forest bureau wage labor for 70%+ of their income dropped from 49.4% in 1997 to 25.2% in 2004, while for mountain-top households this more than halved from 46% in 1997 to 20.9% in 2004. Apart from this common trend, however, Table 3 confirms that these household types differ significantly. Overall, mountain-base households have diversified their income sources the least, and generally depend the most on forest bureaus for their livelihood. Only 38.9% and 34.9% of mountain-base households had more than one income source in 1997 and 2004, respectively, compared to 69% and 75.9% of mountain-top households. In fact, average number of income sources actually declined slightly for mountain-base households – from 1.43 in 1997 to 1.27 in 2004, while for mountain-top households these increased from 2.10 in 1997 to 2.64 in 2004.[8]

Another important distinction is that a larger share of mountain-base households – fully 81.5% in 1997 and 61.9% in 2004 – derive 70%+ of their income from forest bureaus, while only 6.5% and 11.2% obtained 70%+ of their income from non-state sources (non-state off-farm income, rental and sales of assets, agricultural and NTFP income and fuelwood collection) in 1997 and 2004, respectively. In comparison, 68.6% and 43.4% of mountain-top households derived 70%+ of their income from state forest bureaus in 1997 and 2004, respectively. At the same time, the share of mountain-top households obtaining 70%+ of income from non-state-forest-bureau income sources jumped from 12.3% in 1997 to 20.9% in 2004. Furthermore, within this category, the share deriving 70%+ of income solely from NTFPs increased from only 0.4% in 1997 to 2.4% by 2004. Combined with the results from Table 2, this suggests that collection and cultivation of NTFPs in the sample constitutes an important and viable source of income growth, rather than a fall-back option in face of crises.

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[8] Income sources do not include pensions, subsidies, gifts/remittances and other.

[Table 3]

It is possible that the differences between household types could be due to the systematic differences in household age structure found in Table 2; mountain-top households, being generally younger, might have an advantage in human capital and a greater willingness to bear risk, both which are important elements for successfully diversifying income. However, the data does not bear this out. In fact, when restricting the sample to younger households, for example to those with maximum age less than 36 in 1997, these differences become more pronounced. Mountain-base households in this cohort have an average 1.55 and 1.44 income sources for 1997 and 2004, respectively, compared to 2.26 and 2.97 for mountain-top households. Furthermore, while the shares of mountain-base households in this cohort dependent on the forest bureau for 70%+ of their income drops to 74.5% and 53.1% for 1997 and 2004, respectively, these shares are even lower for mountain-top households, at 64.8% and 32.7%. This suggests that systematic differences in the range of productive resources households have access to, captured in household type, influence how successfully these households have been able to diversify their income sources and reduce their dependence on state forest bureaus.

Overall, though these results suggest that while households have on average been able to successful adapt to state forestry sector reforms, striking regional differences are also apparent, as seen in Table 4 below. Heilongjiang is in the worst shape in terms of forest resources (see Table 1), which is playing itself out in terms of forest bureau employment. Already in 1997, 10% of mountain-base households and 8.1% of mountain-top households in the province derived no income from the forest bureau, significantly higher than the combined total of Jilin and Inner Mongolia. In fact, the lower average per-capita incomes in Heilongjiang are clearly due to low average state forest bureau incomes, since Heilongjiang is either higher than or close to the other two provinces in the other income categories. By 2004, in fact, less than 40% of mountain-top households and about 55% of mountain-base households in Heilongjiang obtain 70%+ of their income from forest bureaus. In comparison,

upwards of 70% to 80% of mountain-base households and 50% to 60% of mountain-top households in Jilin and Inner Mongolia depended on forest bureaus for 70%+ of their income in 2004. Apart from these regional differences, it is interesting to note that the general distinctions between mountain-base and mountain-top households found in the full sample also persist at the provincial level. In each province, mountain-top households have higher average income source diversification, on average generate more income from non-state sources (not including remittances, gifts and other), and are the least dependent on forest bureaus for income, with these distinctions becoming more pronounced in 2004.

[Table 4]

IV. DISTRIBUTIONAL CHANGES BY INCOME SOURCE, HOUSEHOLD TYPE AND REGION

This section expands upon these results by exploring the distributional story underlying changes in income. In particular, we estimate the contribution of income source to inequality, and examine how income sources are distributed across household type and region. As a first look at distributional changes, Figure 2 below graphs the survey-weighted empirical cumulative distribution functions (CDF) of net per-capita income for mountain-base and mountain-top populations in 1997 and 2004. As with Table 4 above, clear regional differences are evident. In Heilongjiang Province, the population of mountain-top workers and their families have clearly benefited the most from economic growth and reforms between 1997 and 2004; an un-weighted Kolmogorov-Smirnov test of equality of distributions confirms that while the CDFs of these two household types are close to identical in 1997, the mountain-top income distribution is stochastically dominant (i.e. strictly rightward of the mountain base distribution) by 2004, and strictly so in the mid-to-upper range.[9]

For Jilin and Inner Mongolia, conversely, the mountain-base population income distributions appear to be stochastically dominant in 1997, and in 2004 it is only in the very top range of income where the mountain-top CDF is right of mountain-base. The results from Inner

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[9] Significant at 0.1%.

Mongolia, furthermore, suggest that mountain-top households in the lower range of the income distribution fared the poorest of any group between 1997 and 2004, since the lower portion of this distribution shifted the least of any. An un-weighted Kolmogorov-Smirnov test finds that the mountain-base income distribution for Jilin is more to the right than the mountain-top distribution in both 1997 and 2004, significant at 1% and 5% for these years, respectively. For Inner Mongolia, the mountain-base distribution is also found to be more rightward for both years, significant at 1%. It is also important to note that while households are generally better off in 2004, the shares of mountain-base households in the lowest income ranges in Jilin and Heilongjiang have actually stagnated or increased. For Heilongjiang Province, the share of households with per-capita income of RMB560 or less is constant around 6.3%, while those with RMB428 or less increases from 2.8% in 1997 to 3.9% in 2004. For Jilin, households with per-capita income of RMB805 or less increases from 3.9% to 4.5% between 1997 and 2004, while those with RMB675 or less increases from 1.7% to 2.2%. Thus, though overall the welfare of households has improved, evidence suggests that welfare for those in the very lowest income groups in some regions has declined.

[Figure 2]

To examine the implications of these changes in a more formalized framework, we use the Gini coefficient. Though a number of other inequality measures are available, the Gini is intuitive, widely used and well-recognized, and thus allows for easy comparison with other work. For this analysis, the Gini will be decomposed along two dimensions: income source and population group. For income source, we use the decomposition developed by Lerman and Yitzhaki (1985), as follows:

$$G_0 = \sum_{k=1}^{K} R_k G_k S_k . \qquad (1)$$

Using this framework, the Gini coefficient of total income (G_0) is decomposed into K income sub-components, consisting each of three elements: $R_k = \text{cov}[y_k, F(y_0)] / \text{cov}[y_k, F(y_k)]$, the Gini correlation of income component k, where $F(y_i)$ is the cumulative distribution of income component $i \in \{k, 0\}$; G_k, the Gini coefficient

for component k; and S_k, the share of component k in total income. These can then be used to estimate the marginal effects ($\partial G_0 / \partial y_k$) of a change in component k on total inequality as follows:[10]

$$\frac{\partial G_0 / \partial y_k}{G_o} = (S_k G_k R_k) / G_0 - S_k \qquad (2)$$

Given the position of forest bureaus as both regional delineations and key decision-making units in determining the distribution of state employment, pension and government subsidies, Gini coefficients and marginal effects are calculated at the forest bureau level, and the results are averaged across bureaus. In this way, we can look at both general trends and variations in the contribution of the various income sources to inequality at the forest bureau level.

Table 5 below presents the results. Decompositions are also conducted across the broader divisions of "Forest Bureau Income Sources", "Non-Forest-Bureau Income Sources" and "Gift and Other Income Sources."[11] The marginal effects, which are expressed in percentage terms, are presented under "Contribution to Inequality". In general, these results are suggestive of some important trends:

(1) <u>Total Income:</u> The increase in average income found for the general populations under these forest bureaus has generally been accompanied by a slight increase in inequality, as the average Gini for total income has increased from 0.323 to 0.34;

(2) <u>Forest Bureau Income Sources:</u> While income from forest bureaus is generally the most equally distributed of the three general income sources, it has become more unequal since 1997, with this increase apparently the result of greater inequality in the distribution of wage income. This suggests that forest bureaus are indeed restructuring their labor force based on market incentives, where skill and experience garner greater wage and employment premiums;

(3) <u>Non-Forest-Bureau Income Sources:</u> Income from non-forest-bureau income sources is

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[10] This assumes y_k increases exogenously by a uniform percentage for all members of the population (Stark *et al.*, 1986).
[11] Forest Bureau income sources consist of forest bureau wage, pension and subsidy income. Non-forest-bureau income sources consists of non-state off-farm wage sector, sales/rental of fixed & productive assets, net cropping, net husbandry and net NTFP income, and fuelwood collection. Gift and other sources consists of gift, support from relatives and remittances, and other.

generally more unequally distributed, but it has become more equally distributed since 1997. This suggests that a greater share of the population under forest bureaus is gaining access to non-forest-bureau income sources, and particularly to the "Non-State Off-Farm Sector", whose average Gini decreased from 0.852 in 1997 to 0.772 in 2004. Furthermore, greater access to the non-state off-farm sector appears to be generally reducing inequality amongst forest bureau populations, since by 2004 the average marginal effect of this income source is to reduce inequality by 3.7% for an additional 1 RMB of total "Non-State Off-Farm Sector" income in the population. It is also important to note that access to fuelwood resources is associated with a reduction in inequality, since in both 1997 and 2004 an additional 1 RMB of total "Fuelwood" income reduces inequality within forest bureau populations on average by 1.2%;

(4) <u>Options for Diversification:</u> While inequality of non-forest-bureau income is generally decreasing, the individual components of this category (i.e. "Non-State, Off-Farm Sector", "Sales/Rental of Fixed and Productive Assests", etc.) are still distributed highly unequally. This indicates that particular subgroups of households are focusing their energies on particular income strategies, suggesting that multiple paths of income diversification away from state forest bureau income sources exist in the population, and that the availability of options for diversification has increased.

[Table 5]

As a final enrichment of the distribution story, we also explore the decomposition of the Gini by household type and region. We use the Gini decomposition developed in Bhattacharya and Mahalanobis (1967), Rao (1969) and Pyatt (1976), as follows,

$$G_o = G_B + \sum a_k G_k + R \tag{3}$$

whereby the Gini for the full population (G_o) can be characterized as the sum of (i) the contribution of inequality between groups to total inequality, which is the between-groups Gini (G_B), defined as that which would obtain if every income in each population subgroup k was equal to the relevant sub-group mean, (ii) the contribution of inequality within each

subgroup to total inequality ($\sum a_k G_k$), where G_k is the Gini coefficient for subgroup k and a_k is the product of population share and income share going to subgroup k, and (iii) the "overlap" residual term (R), which is zero if subgroup income ranges do not overlap (Lambert and Aronson, 1993).

Various authors have expressed reservations regarding the attractiveness of the Gini for subgroup decompositions due to this residual term, which in essence captures the portion of the distribution where the "between-group" and "within-group" effects cannot be disentangled (e.g. Mookherjee and Shorrocks, 1982). However, Lambert and Aronson (1993) provides an excellent graphical interpretation of the residual, showing that the magnitude of the residual increases as (1) the range of overlap between the sub-group distributions increases, and (2) the differences between subgroup means decreases, both which either directly or indirectly indicate greater overlap between subgroup income distributions. They note that in cross-section analysis, the residual can prove valuable, "…where one is seeking a succinct quantitative description or anatomy of the income distribution, e.g. across regions, in which overlapping is of obvious interest." Milanovic (2002), for example, uses the overlap term to infer the importance of location to income. Thus, for our purposes, the Gini subgroup decomposition is ideal.

Of particular interest is comparison between the degree to which between-group inequality explains total inequality, as compared to within-group inequality and the overlap term. A high share of the gini explained by between-group inequality indicates that differences in subgroup mean income are a significant factor in explaining total inequality. Conversely, a high share of the gini explained by either within-group inequality or the overlap term indicates that income stratification by the subgroup in question is low. Table 6 below presents the results.[12] As can be seen, these are clearest regarding household type. In particular, for most income sources and total income, the contribution of between-group inequality to total inequality is

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[12] Table 6 also presents Ginis for the full population, for comparison with the Ginis averaged across forest bureaus as presented in Table 5.

small; within-group inequality and overlap explain, by far, the largest share of the gini.

[Table 6]

The important exceptions to this are cropping and NTFP income, where between-group inequality is the largest share of the gini in both years. Combined with the previous results, this indicates that it is the mountain-top populations that have by far benefited the most from access to agricultural and forest land, since not only is the between-group contribution largest, but the overlap terms are very small, indicating little overlap between the income ranges of each group. This suggests that access to these key resources has been an important factor behind differences in income growth between these two household types. This interpretation is further strengthened by the fact that both total income and income components do not stratify easily along provincial delineations. Although this might indicate that natural conditions and institutional factors at the sub-regional and perhaps forest-bureau level are more important in defining income stratification, it also suggests that household type, and in particular the associated access to particular productive resources, in a more important determinant of income level and growth.

V. CONCLUSION

The unsatisfactory economic and environmental performance of the country's state forest bureaus has been an important concern for Chinese policymakers. It has also led to greater recognition of the adverse incentives for unsustainable management of state forest area that have been created by the heavy social welfare and employment burdens faced by these bureaus (Xu et al., 2006). At the same time, ironically, these burdens have also made policymakers hesitant to conduct more substantive restructuring of the state forestry sector, due to fears of the potentially significant adverse welfare impacts such reforms could have on the households and communities dependent on state forest bureaus.

To shed light on the options available to policymakers, this paper provides the most comprehensive assessment to date of the changes that have occurred in income structure and

level for the population of state forest bureau households and workers over the past decade. The most important finding of the paper is that, contrary to the worries of central authorities, the social costs of restructuring appear to be much lower than previously imagined by government leaders. In particular, household per capita income has significantly improved over the past decade, and households have been successful at reducing their dependence on state forest bureaus via income diversification. The distinct experiences of mountain-top and mountain-base households, furthermore, provide a number of valuable insights into the directions that future reforms should take.

The important and growing contribution of agriculture and non-timber forest products for mountain-top household income, first of all, suggests that reforms in forest land tenure, use and access rights will be an important next step for solidifying existing trends in income growth. Secondly, the off-farm private sector has also clearly been an important source of income growth and an equalizer of income distributions for both household types. This is in line with the results of other recent research on this sector in China (Mohapatra et al., 2006; Zhang et al., 2006). As such, policies that encourage private sector development (e.g. reduction of regulatory barriers, improved access to credit, etc.) should also be an important part of future reform packages, since they will help to improve the livelihood options available to households by allowing them to better utilize their relative strengths and abilities. This is an important result, in fact, since it runs counter to arguments still made by key voices within the State Forestry Administration that the best way forward is greater investment in and reentrenchment of the state, such as through development of state-owned processing capacity.

Finally, these results also indicate that the state still has an important role to play during this transitional process. In particular, income for the poorest households in the sample has in general grown the least, and in some cases actually decreased over the past decade as forest bureau labor has been restructured due to the Natural Forest Protection Program. This suggests that subsidies and social welfare programs targeting the poorest and most vulnerable households should be an important part of any future reform package of the state forestry

sector. Overall, the significant growth in the importance of the non-state sector for household income seen in the sample provides a clear signal to policymakers that market development and privatization are the best way forward for reforming the state forestry sector.

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Table 1 China's State Forest Bureaus - Employment and Resources, 2004

	Total	Heilongjiang	Jilin	Inner Mongolia
Number of State Forest Bureaus*	**135**	40	18	17
Population Under State Forest Bureaus	**2,677,564**	1,433,413	546,982	312,333
State Forest Bureau Employed Workers	**553,319**	279,171	101,232	79,392
*Share of Total Employed in State Forestry Sector**	***36.9%***	*75.7%*	*60.9%*	*55.2%*
Laid-Off Workers with One-Time Settlement (since 1998)	**208,439**	44,877	44,877	25,798
State Forest Bureau Idle Workers	**62,374**	30,307	21,955	1,019
State Forest Bureau Retired Workers	**381,120**	161,270	66,649	51,443
Workers Who've Left but Retain Worker Status.	**261,642**	167,385	37,886	29,969
Area *(million ha)*	**33.71**	8.45	3.17	9.16
Forested Area	**28.43**	7.98	3.06	8.00
Share of Total State-Owned Forested Area	***40.5%***	*11.4%*	*4.4%*	*11.4%*
Share of National Forested Area	***16.8%***	*4.7%*	*1.8%*	*4.7%*
Forest Volume *(million m^3)*	**3168**	696	450	850
Share of Total State-Owned Forest Area Volume	***35.6%***	*7.8%*	*5.1%*	*9.5%*
Share of National Forest Volume	***23.9%***	*5.3%*	*3.4%*	*6.4%*

* These are forest bureaus that specialize in harvesting and processing. An additional 20 bureaus exist that specialize only in silviculture and afforestation work. / ** For total, this is share of national total. For the provinces, this is share of each provincial total.

Source: Labor and Population Statistics from ZGLYTJNJ (2004). Forest Area and Volume from QGSLZYTJ (2004).
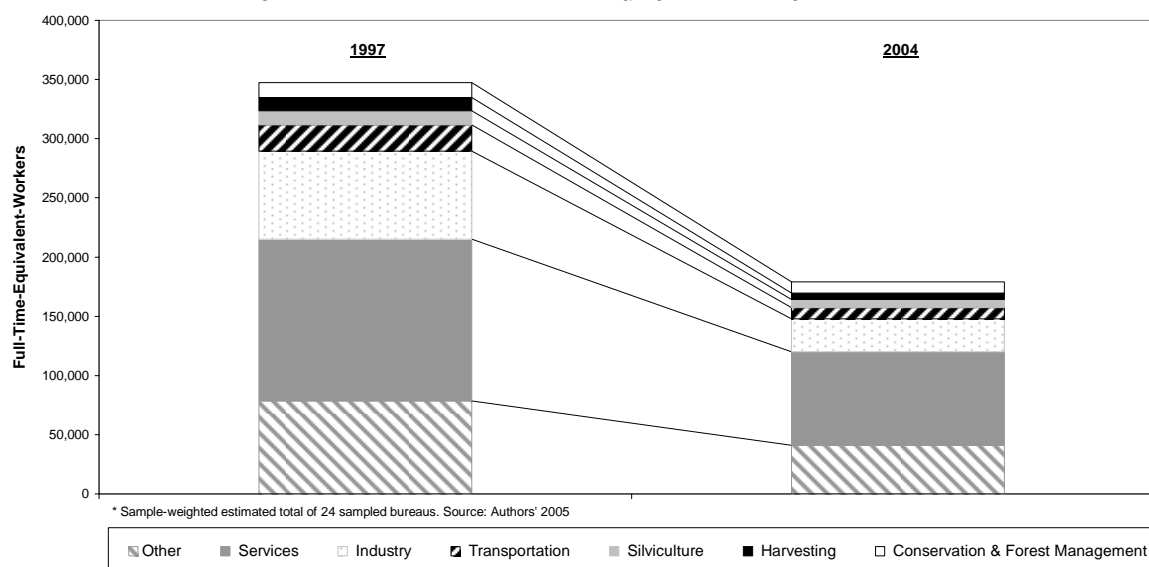

Figure 1 State Forest Bureau Labor Structure, Heilongjiang, Jilin & Inner Mongolia, 1997 & 2004*

* Sample-weighted estimated total of 24 sampled bureaus. Source: Authors' 2005

Table 2 Household Characteristics and Mean Per Capita Net Income, 1997 & 2004

			"Mountain-Base" Households** (n = 695, 700)		"Mountain-Top" Households (n = 684, 679)	
			1997	2004	1997	2004
HOUSEHOLD CHARACTERISTICS						
Household Population			3.41 (0.03)	3.22 (0.05)	3.27 (0.06)	3.13 (0.05)
Labor-Age Adults			2.45 (0.03)	2.24 (0.05)	2.37 (0.06)	2.28 (0.06)
Maximum Age			49.3 (0.64)	54.8 (0.48)	45.7 (0.82)	51.5 (0.73)
Average Age			35.5 (0.51)	42.2 (0.45)	33.9 (0.7)	40.4 (0.7)
Maximum Years of Education			10.8 (0.19)	11.0 (0.22)	9.4 (0.17)	9.6 (0.18)
MEAN PER CAPITA NET INCOME (in 2004 RMB)*						
Average Total Growth Rate, 1997-2004			*79.2% (5.8%)*		*130.3% (15.9%)*	
Total			**2253 (124)**	**3355 (203)**	**1956 (75)**	**3509 (145)**
		Wage	1181 (91)	1276 (142)	1024 (58)	1170 (72)
Forest Bureau		Pension***	613 (68)	1072 (80)	323 (29)	574 (44)
		Subsidy	104 (44)	107 (12)	19 (3)	65 (8)
Non-State Off-Farm Sector		Total	215 (61)	570 (56)	199 (22)	542 (51)
From Work Outside of the Forest Bureau Area			34 (15)	133 (21)	38 (9)	141 (32)
Sales/Rental of Fixed or Productive Assets			1 (1)	30 (12)	9 (7)	21 (9)
Agriculture	Cropping, *Net*		9 (5)	15 (6)	182 (34)	400 (73)
	Husbandry & Aquaculture, *Net*		4 (3)	16 (14)	6 (7)	80 (33)
Non-Timber Forest Products, *Net*			8 (3)	17 (12)	63 (12)	369 (66)
Fuelwood			49 (17)	33 (9)	71 (5)	100 (8)
Gifts, Support from Relatives & Remittances			37 (10)	124 (19)	38 (9)	112 (23)
Other			32 (15)	96 (18)	22 (5)	75 (19)

Note: Standard deviations for population estimates are in parentheses.
* Income is adusted to 2004 RMB using regional rural CPI (ZGTJNJ, various years). / ** The term "mountain-base" (shanxia) refers to households that generally work in administration, support, processing and other industries, and therefore tend to live in urban areas. "Mountain-top" (shanshang) households are more rural, and generally work in harvesting, transportation, silviculture and forest management. / *** This includes compensation for injury or death, though the contribution of this is negligible.

Table 3 Household Income Diversification and Income Source Dependence, 1997 & 2004

Item	*"Mountain-Base"* Households (n = 695, 700)		*"Mountain-Top"* Households (n = 684, 679)	
	1997	2004	1997	2004
Average Number of Household Income Sources (*Not Including Pension, Subsidies, Gift or Other)**	1.43 *(0.11)*	1.27 *(0.07)*	2.10 *(0.06)*	2.64 *(0.08)*
Share of households …				
...with two or more sources of income. (*Not including Pension, Subsidy, Gifts or Other*)	38.9% *(4.5%)*	34.9% *(3.1%)*	69.2% *(2.9%)*	75.9% *(2.2%)*
...with members working outside of the province in the non-state sector.	0.4% *(0.2%)*	1.4% *(0.5%)*	0.9% *(0.6%)*	1.1% *(0.4%)*
...deriving no income from the Forest Bureau.	5.6% *(2.2%)*	7.9% *(1.4%)*	6.4% *(1.2%)*	8.2% *(1.2%)*
Share of households deriving 70%+ of income from the following sources:				
Combined Forest Bureau Income Sources	**81.5% *(5.3%)***	**61.9% *(3.3%)***	**68.6% *(2.1%)***	**43.4% *(2.1%)***
Forest Bureau — Wage Labor	49.4% *(3.8%)*	25.2% *(2.6%)*	46.0% *(2%)*	20.9% *(1.7%)*
Forest Bureau — Pension	17.1% *(1.4%)*	21.2% *(1.7%)*	13.0% *(1.9%)*	13.5% *(1.8%)*
Forest Bureau — Subsidies	0.5% *(0.3%)*	2.3% *(0.6%)*	0.7% *(0.4%)*	1.0% *(0.5%)*
Combined Non-Forest-Bureau Income Sources***	**6.5% *(2.4%)***	**11.2% *(1.9%)***	**12.3% *(1.6%)***	**20.9% *(1.7%)***
Non-State Off-Farm Sector	6.1% *(2.3%)*	9.2% *(1.4%)*	4.5% *(0.9%)*	5.6% *(1.2%)*
Sales/Rental of Fixed or Productive Assets	0.0% *(0%)*	0.0% *(0%)*	0.1% *(0.1%)*	0.0% *(0%)*
Agriculture — Cropping, *Net*	0.1% *(0.1%)*	0.5% *(0.4%)*	2.2% *(0.7%)*	2.2% *(0.7%)*
Agriculture — Husbandry & Other, *Net*	0.0% *(0%)*	0.3% *(0.2%)*	0.1% *(0.1%)*	0.4% *(0.2%)*
Non-Timber Forest Products, *Net*	0.0% *(0%)*	0.0% *(0%)*	0.4% *(0.3%)*	2.4% *(0.7%)*
Fuelwood	0.0% *(0%)*	0.0% *(0%)*	0.2% *(0.2%)*	0.5% *(0.3%)*
Combined Gift and Other Income Sources	**1.1% *(0.6%)***	**2.6% *(0.8%)***	**0.6% *(0.3%)***	**2.0% *(0.7%)***
Gifts, Support from Relatives & Remittances	0.8% *(0.4%)*	1.6% *(0.7%)*	0.3% *(0.2%)*	1.0% *(0.5%)*
Other	0.3% *(0.2%)*	0.7% *(0.3%)*	0.2% *(0.2%)*	0.4% *(0.3%)*

Note: Standard deviations for these population estimates are in parentheses.

* Maximum of 7 sources: state forest bureau wage, non-state off-farm, cropping, husbandry, NTFP production, fuelwood and rental or sales of fixed and productive assets. / ** This includes pension income and government subsidies. / *** Not including Gifts, Support from Relatives & Remittances, and Other.

Table 4 Regional Differences in Mean Per Capita Income and Household Income Diversification, 1997 & 2004.

ITEM		"Mountain-Base" Households (n = 695, 700)		"Mountain-Top" Households (n = 684, 679)	
		1997	2004	1997	2004
Mean per capita Income	*Average Total Growth Rate, 1997-2004* — *Heilongjiang*	84.7% (7.7%)		148.9% (21%)	
	Jilin	67.1% (10.8%)		85.0% (17.3%)	
	Inner Mongolia	78.6% (3.3%)		57.4% (16.4%)	
	Total Income* — *Heilongjiang*	1779 (88)	2822 (189)	1831 (94)	3479 (184)
	Jilin	2919 (192)	4288 (261)	2474 (124)	3699 (209)
	Inner Mongolia	2519 (44)	4009 (150)	1963 (100)	3260 (427)
	Forest Bureau Income — *Heilongjiang*	1316 (86)	1925 (155)	1160 (62)	1636 (86)
	Jilin	2538 (216)	3320 (278)	1977 (129)	2314 (131)
	Inner Mongolia	2309 (25)	3253 (63)	1671 (101)	2233 (225)
	Non-Forest-Bureau Income — *Heilongjiang*	353 (47)	645 (77)	599 (62)	1643 (155)
	Jilin	331 (48)	768 (178)	447 (63)	1247 (186)
	Inner Mongolia	184 (38)	665 (131)	279 (55)	841 (181)
	Gifts, Remittances and Other Income Sources — *Heilongjiang*	110 (33)	251 (49)	72 (14)	201 (38)
	Jilin	50 (9)	201 (36)	50 (9)	138 (22)
	Inner Mongolia	27 (16)	91 (23)	14 (4)	186 (109)
Income Diversification and Source Dependence	Average Number of Household Income Sources (*Not Including Pension, Subsidies, Gift or Other*)** — *Heilongjiang*	1.17 (0.06)	1.19 (0.08)	1.98 (0.08)	2.52 (0.1)
	Jilin	1.30 (0.1)	1.22 (0.13)	2.50 (0.11)	3.03 (0.14)
	Inner Mongolia	1.80 (0.07)	1.77 (0.12)	2.20 (0.14)	2.66 (0.09)
	Share of households …				
	...with two or more sources of income (*Not including Pension, Subsidy, Gifts or Other*)** — *Heilongjiang*	27.3% (3.1%)	31.9% (3.3%)	65.3% (3.8%)	74.2% (2.8%)
	Jilin	36.8% (7.6%)	32.7% (6.4%)	78.3% (3.8%)	80.7% (3.3%)
	Inner Mongolia	54.0% (4.2%)	53.8% (6.1%)	78.6% (5.5%)	80.9% (3%)
	...deriving no income from the State Forest Bureau*** — *Heilongjiang*	10.0% (2.5%)	10.2% (1.8%)	8.1% (1.7%)	9.1% (1.6%)
	Jilin	5.2% (2.7%)	5.3% (1.3%)	3.4% (1.6%)	6.2% (2.4%)
	Inner Mongolia	0.0% (0%)	1.2% (0.9%)	0.7% (0.7%)	4.8% (2%)
	Share of households deriving 70%+ of income from …				
	Forest Bureau Income Sources — Heilongjiang	69.8% (3.6%)	55.2% (3.3%)	64.1% (2.5%)	39.9% (2.5%)
	Jilin	87.1% (3.3%)	70.2% (4.3%)	75.7% (4.6%)	51.0% (3.8%)
	Inner Mongolia	93.9% (3%)	80.9% (2.6%)	84.5% (4.1%)	59.8% (3.7%)
	Non-Forest Bureau Income Sources**** — Heilongjiang	11.0% (2.5%)	12.8% (2.4%)	16.1% (2%)	23.3% (2.1%)
	Jilin	7.9% (2%)	9.8% (2.9%)	5.6% (2.5%)	16.9% (3.1%)
	Inner Mongolia	0.0% (0%)	4.6% (2.5%)	0.7% (0.7%)	5.3% (2%)
	Gifts, Remittances and Other Income Sources — Heilongjiang	2.2% (0.9%)	3.8% (1.1%)	0.5% (0.3%)	2.3% (0.9%)
	Jilin	0.6% (0.6%)	1.0% (0.6%)	1.2% (0.9%)	1.4% (1%)
	Inner Mongolia	0.0% (0%)	0.0% (0%)	0.0% (0%)	1.3% (1.3%)

Note: Standard deviations for these population estimates are in parentheses.

* Income is adjusted to 2004 RMB using regional rural CPI (ZGTJNJ, various years) / ** Maximum of 7 sources: state forest bureau wage, non-state off-farm, cropping, husbandry, NTFP production, fuelwood and rental or sales of assets. / *** This includes pension income and government subsidies. / **** Not including Gifts, Support from Relatives & Remittances, and Other.

Figure 2 Empirical Distributions of Per Capita Net Income, 1997 & 2004 *(in 2004 RMB)*
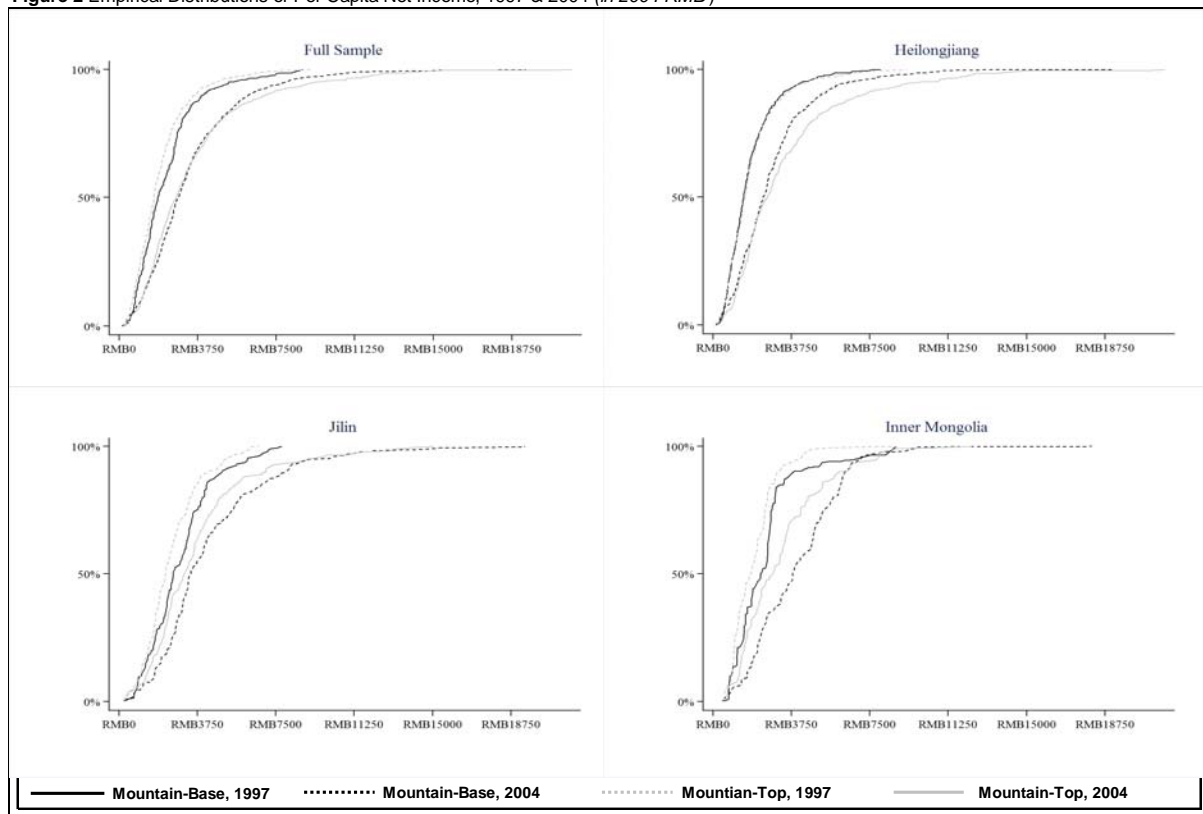
Table 5 Decomposition of Gini Coefficent by Income Source, Averages Across Forest Bureaus, 1997 & 2004

	Income Component	Gini Coefficient				Contribution to Inequality			
		Mean	St. Dev.	Min.	Max.	Mean	St. Dev.	Min.	Max.
1997	**Total Income**	**0.323**	**(0.034)**	**0.261**	**0.374**				
	Wage Labor	0.512	(0.078)	0.311	0.647	-7.4%	(10.6%)	-30.1%	11.0%
	Forest Bureau — Pension	0.770	(0.056)	0.675	0.892	2.7%	(9.1%)	-16.2%	27.2%
	Subsidies	0.882	(0.085)	0.629	0.973	0.2%	(3.9%)	-3.9%	14.0%
	Non-State Off-Farm Sector	0.852	(0.067)	0.660	0.974	1.2%	(9.3%)	-20.4%	18.4%
	Sales/Rental of Fixed & Productive Assets	0.981	(0.009)	0.967	0.994	0.2%	(0.8%)	-0.3%	3.3%
	Agriculture — Cropping, *Net*	0.960	(0.033)	0.845	0.995	3.3%	(6.8%)	-3.1%	28.6%
	Husbandry & Aquaculture, *Net*	0.976	(0.021)	0.908	0.996	-0.2%	(0.8%)	-3.5%	0.5%
	Non-Timber Forest Products, *Net*	0.953	(0.028)	0.877	0.983	0.0%	(1.1%)	-2.1%	3.5%
	Fuelwood	0.769	(0.152)	0.415	0.963	-1.2%	(1%)	-3.5%	0.7%
	Gifts, Support from Relatives & Remittances	0.919	(0.038)	0.826	0.971	0.5%	(2.4%)	-2.1%	8.3%
	Other	0.942	(0.042)	0.851	0.993	0.5%	(5%)	-11.2%	19.9%
	Combined Sources								
	Forest Bureau Income Sources	0.382	(0.058)	0.287	0.553	-4.4%	(12%)	-20.7%	22.5%
	Non-SFB Income Sources*	0.761	(0.073)	0.620	0.910	3.4%	(11.2%)	-20.7%	21.2%
	Gift and Other Income Sources	0.896	(0.056)	0.766	0.971	1.0%	(6.8%)	-12.9%	28.1%
2004	**Total Income**	**0.340**	**(0.048)**	**0.241**	**0.440**				
	Wage Labor	0.608	(0.077)	0.486	0.752	-4.6%	(10.3%)	-21.9%	17.7%
	Forest Bureau — Pension	0.724	(0.063)	0.638	0.881	3.7%	(10.3%)	-18.9%	25.9%
	Subsidies	0.794	(0.09)	0.594	0.926	-2.6%	(3.1%)	-10.3%	3.9%
	Non-State Off-Farm Sector	0.772	(0.08)	0.608	0.932	-3.7%	(7.2%)	-16.7%	11.9%
	Sales/Rental of Fixed & Productive Assets	0.973	(0.014)	0.936	0.997	0.7%	(1.5%)	-0.7%	5.2%
	Agriculture — Cropping, *Net*	0.947	(0.037)	0.836	0.996	2.6%	(5.9%)	-3.6%	24.1%
	Husbandry & Aquaculture, *Net*	0.979	(0.01)	0.964	0.996	1.6%	(3.3%)	-2.7%	14.0%
	Non-Timber Forest Products, *Net*	0.945	(0.042)	0.789	0.987	2.5%	(6.3%)	-5.4%	26.5%
	Fuelwood	0.773	(0.143)	0.467	0.968	-1.2%	(0.8%)	-3.2%	0.0%
	Gifts, Support from Relatives & Remittances	0.900	(0.04)	0.820	0.952	0.0%	(2.2%)	-3.5%	5.3%
	Other	0.926	(0.052)	0.812	0.993	1.0%	(3.1%)	-3.8%	10.8%
	Combined Sources								
	Forest Bureau Income Sources	0.421	(0.07)	0.279	0.619	-3.5%	(10.2%)	-26.8%	12.9%
	Non-SFB Income Sources*	0.711	(0.073)	0.560	0.857	2.5%	(12.1%)	-17.2%	27.1%
	Gift and Other Income Sources	0.860	(0.064)	0.724	0.952	1.0%	(4.3%)	-7.3%	13.2%

* Does not include Gift and Other Income Sources.

Table 6 Decomposition of the Gini Coefficient for Net Per Capita Income by Household Type and Province

Income Component	Gini Coefficient	Subgroup Decomposition (% of Gini explained by …)					
		Household Type			Province		
		Between-Group Inequality	Within-Group Inequality	Overlap	Between-Group Inequality	Within-Group Inequality	Overlap
1997							
Total Income	**0.351**	**6.5%**	**67.0%**	**26.6%**	**28.7%**	**25.0%**	**46.2%**
Wage Labor	0.521	4.7%	67.1%	28.2%	29.7%	24.8%	45.4%
Forest Bureau Pension	0.778	11.5%	70.1%	18.4%	20.0%	22.3%	57.6%
Subsidies	0.960	17.6%	75.5%	6.9%	44.8%	10.4%	44.8%
Non-State Off-Farm Sector	0.891	1.6%	67.0%	31.4%	27.3%	37.9%	34.8%
Sales/Rental of Fixed & Productive	0.998	48.9%	38.3%	12.7%	51.4%	30.5%	18.1%
Agriculture Cropping	0.979	65.5%	28.8%	5.7%	43.2%	47.3%	9.5%
Husbandry & Aquaculture	0.987	14.5%	57.9%	27.6%	31.5%	21.4%	47.1%
Non-Timber Forest Products	0.967	47.8%	39.3%	12.8%	12.6%	26.8%	60.6%
Fuelwood	0.787	8.9%	63.3%	27.8%	38.8%	17.2%	44.0%
Gifts, Support from Relatives & Other	0.948	0.6%	65.5%	33.9%	21.6%	37.8%	40.6%
	0.982	6.1%	69.4%	24.5%	32.9%	43.2%	23.9%
Combined Sources							
Forest Bureau Income Sources	0.409	12.5%	68.0%	19.4%	37.2%	22.6%	40.2%
Non-Forest-Bureau Income Sources*	0.796	15.8%	59.5%	24.7%	19.4%	35.6%	45.0%
Gift and Other Income Sources	0.938	2.5%	67.3%	30.2%	27.5%	40.0%	32.5%
2004							
Total Income	**0.366**	**5.7%**	**59.4%**	**34.8%**	**19.3%**	**46.1%**	**34.6%**
Wage Labor	0.642	1.5%	63.0%	35.5%	21.8%	42.2%	35.9%
Forest Bureau Pension	0.735	13.6%	65.5%	20.9%	15.3%	44.0%	40.7%
Subsidies	0.836	9.9%	65.9%	24.2%	3.1%	47.5%	49.4%
Non-State Off-Farm Sector	0.783	0.3%	61.9%	37.9%	5.6%	48.2%	46.2%
Sales/Rental of Fixed & Productive	0.993	2.8%	63.5%	33.7%	26.3%	46.6%	27.0%
Agriculture Cropping	0.965	66.5%	28.9%	4.6%	27.4%	60.8%	11.8%
Husbandry & Aquaculture	0.990	41.0%	41.9%	17.0%	18.0%	40.0%	41.9%
Non-Timber Forest Products	0.974	70.0%	27.1%	2.9%	8.9%	53.2%	37.9%
Fuelwood	0.824	31.4%	49.2%	19.4%	25.8%	40.4%	33.8%
Gifts, Support from Relatives & Other	0.915	0.2%	61.6%	38.2%	6.1%	49.4%	44.5%
	0.959	4.7%	64.3%	31.1%	15.7%	56.0%	28.3%
Combined Sources							
Forest Bureau Income Sources	0.454	11.0%	63.7%	25.4%	26.8%	43.0%	30.2%
Non-Forest-Bureau Income Sources*	0.736	28.1%	51.4%	20.5%	5.3%	49.7%	45.0%
Gift and Other Income Sources	0.885	2.4%	62.6%	35.0%	8.2%	52.5%	39.3%

* Does not include Gift/Support/Remittance and Other Income Sources.