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Land Reform and Its Effect on Farm Household Income Inequality: Evidence from Georgia

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Abstract: This article examines the importance of landholdings in explaining income inequality among family farms in four districts in Georgia following the land reform of the 1990s. Income inequality is decomposed by sources of income and by determinants of income. The results indicate that farm income is a disequalizing source of income among family farms in these districts. In addition, a uniform increase in landholding is expected to reduce income inequality. Combining the two results, we conclude that the impact of land reform on farm household income inequality depends on the resulting distribution of landholdings. It can reduce inequality if land is distributed relatively equally, but inequality can increase if the wealthier farmers are able to gain control of more (and perhaps better) land resources. A possible implication of this result is that for land reform to be equalizing, distributing land to smallholders should be accompanied by additional policies and regulations supporting small farmers, such as land titling and registration, support for cooperation, and access to credit and other market services.

Keywords: land reform; inequality decomposition; transition countries

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1. Introduction

Most researchers agree that income inequality rises during transition periods, although there is more than one explanation for this (Milanovic 1998; Ravallion and Chen 1999). The increase in inequality is, however, far from being homogeneous across countries (Mitra and Yemtsov 2006). The literature has attributed much of the increase in inequality to wage dispersion (Leitner and Holzner 2008). Nevertheless, several studies have found that agricultural income is a major source of inequality (e.g., Kai-yuen 1998). The other side of the coin is that non-farm income has an equalizing effect on total income, as has been found in the U.S. (El-Osta et al. 1995), China (Zhu and Luo 2006), Egypt (Adams 2001), Taiwan (Chinn 1979), and the Philippines (Leones and Feldman 1998). Gallup (2002), on the other hand, found that income other than farming contributed positively to inequality in Vietnam, and similar results were obtained by Elbers and Lanjouw (2001) for Ecuador. de Janvri and Sadoulet (2001) found that in Mexico, non-farm income as a whole reduced household income inequality, but non-agricultural wages in particular increased inequality. In contrast, Canagarajah et al. (2001) found that in Ghana and Uganda, non-farm self-employment income was much more disequalizing than non-farm wages. Estudillo et al. (2001) found that non-farm income changed from an equalizing to a disequalizing source as it became a major income source in Philippine rice villages.

Land is the major input of agricultural production in transition economies. Hence, land reform is potentially an important determinant of rural income inequality. However, the impact of land reform on inequality is ambiguous ex ante. Allocating farmland among landless households is likely to reduce rural income inequality, while the establishment of land markets could allow the richest producers to expand production, thereby increasing inequality. Wan and Zhou (2005), for example, found that land is a potentially equalizing

variable in rural China, although the magnitude of this effect is not impressive. Similar conclusions have been obtained for Latin America by Kay (1998). On the other hand, Boberg-Fazlić et al. (2022) showed that a Danish land reform resulted in increased rural inequality, Li et al. (2023) found a similar result in Vietnam, and Faguet et al. (2018) found that a land reform in Colombia decreased (increased) inequality in regions where land was initially more (less) equally distributed. Adams (2001) found that landholdings have a positive effect on agricultural income inequality in Egypt, while they negatively affect non-agricultural income inequality.

The purpose of this article is to assess the inequality-reducing potential of the on-going land reform in Georgia. When Georgia was part of the Soviet Union, agriculture was characterized by absolute state ownership of all agricultural land and concentration of production in large-scale collective farms. After Georgia became independent following the dissolution of the Soviet Union at the end of 1991, the entire country was in total disarray and experienced a bitter civil war. As a consequence, Georgian agriculture collapsed, and the land held by large collective farms was quickly distributed to rural households in an attempt to avoid famine. Georgia completely individualized its agriculture as early as 1992–1993 (Lerman 1999). The individual sector in Georgia currently produces almost 100% of agricultural output, up from 40% before 1990. The shift of production to the individual sector is a reflection of the dramatic increase in the land-holdings of rural households. Prior to 1990, only 7% of agricultural land was in individual use. A decade later, in 2000, 37% of agricultural land (or more than 70% of arable land) was used by individual farmers (Lerman 2005). Although Georgia has been among the leading former Soviet countries in the land reform process (Swinnen and Heinegg 2002; Lerman 2009), the progress of the reform was hampered by institutional barriers (Lerman 1997). In particular, land registration, which is an important pre-condition for a well-developed land market, has been lagging. Smallholder farmers also needed modern support systems to support their development. Cooperation could be an optimal strategy for these farmers, but anti-cooperative sentiments and lack of proper legislation prohibited their establishment (Lerman and Sedik 2014).[1] Evidence exists for a gradual process of concentration of farmland in the hands of large producers, mostly through land rentals. Hence, it is difficult to assess a priori the contribution of land reform to income inequality.

Lacking consistent longitudinal income data, this article is based on a cross-sectional decomposition of income inequality, using a survey of farm households that was conducted in four selected districts in Georgia in 2003. Income inequality can be decomposed in various dimensions. This paper applies inequality decomposition by income sources, introduced by Shorrocks (1982, 1983), which was subsequently extended by Morduch and Sicular (2002) and Fields (2003) to regression-based decomposition by determinants of income. A description of these decomposition methods is provided in the next section. After that, the data used in this study are described. The paper continues with the presentation of the empirical results. The last section contains a summary and some concluding comments.

As mentioned above, the existing literature provides mixed results about the contribution of agricultural income to overall farm household income inequality and about the role of landholdings in this contribution. One reason for this is the use of different methodologies. Another reason is that some of the studies misinterpret the inequality decomposition results (see Kimhi 2011). In addition, the effects of agricultural income and landholdings on inequality are theoretically ambiguous, so it is not surprising that different results are obtained in different countries and in different situations. The contribution of this study, besides being the first to analyze farm income inequality in Georgia, is the use of two types of inequality decomposition methods—by income sources and by income determinants. These two approaches complement each other, especially for highlighting the role of the landholding distribution during a period of land reform. The few existing applications of regression-based inequality decomposition techniques mostly look at the reduced-form effects of landholdings on income inequality—and hence often obtain results that seem to be straightforward but are not interpreted correctly (e.g., Wan and Zhou 2005) or obtain

insignificant effects that might miss the underlying structural mechanisms (e.g., Morduch and Sicular 2002)—while this application is using an interpretation that enables us to discuss the effects of more refined changes in the landholding distribution on inequality and identify its pattern.

Our working hypothesis is that agricultural income and non-agricultural income have different roles in the determination of overall income inequality, and that landholdings have an important role as well. However, neither economic theory nor the existing literature provide a basis for predicting the directions of these effects. Given the complexity of the problem and the lack of longitudinal data, the results of this study imply that the impact of land reform on farm household income inequality depends on the way the reform is implemented, i.e., does it increase landholdings in a uniform way or in a way that is more beneficial to smaller or larger landholders. It also depends on other developments that occur in the rural sector, such as the availability of non-farm income sources and the role of remittances.

2. Inequality Decomposition Methods

Shorrocks (1982, 1983) suggested focusing on inequality measures that can be written as a weighted sum of incomes:

$$I(\mathbf{y}) = \Sigma_i a_i(\mathbf{y}) y_i, \tag{1}$$

where a_i are the weights, y_i is the income of household i, and $\mathbf{y}$ is the vector of household incomes. If income is observed as the sum of incomes from k different sources, $y_i = \Sigma_k y_i{}^k$, the inequality measure (1) can be written as the sum of source-specific components S^k:

$$I(\mathbf{y}) = \Sigma_i a_i(\mathbf{y}) \Sigma_k y_i{}^k = \Sigma_k [\Sigma_i a_i(\mathbf{y}) y_i{}^k] \equiv \Sigma_k S^k. \tag{2}$$

Dividing (2) by $I(\mathbf{y})$, one obtains the proportional contribution of income source k to overall inequality as follows:

$$s^k = \Sigma_i a_i(\mathbf{y}) y_i{}^k / I(\mathbf{y}). \tag{3}$$

Shorrocks (1982) noted that the decomposition procedure (3) yields an infinite number of potential decomposition rules for each inequality index, because in principle, the weights $a_i(\mathbf{y})$ can be chosen in numerous ways, so that the proportional contribution assigned to any income source can be made to take any value between minus and plus infinity. In particular, three measures of inequality that are commonly used in empirical applications are (a) the Gini index, with $a_i(\mathbf{y}) = 2(i - (n+1)/2)/(\mu n^2)$, where i is the index of observation after sorting the observations from lowest to highest income, n is the number of observations, and μ is mean income; (b) the squared coefficient of variation with $a_i(\mathbf{y}) = (y_i - \mu)/(n\mu^2)$; and (c) Theil's T index with $a_i(\mathbf{y}) = \ln(y_i/\mu)/n$.

Shorrocks (1982) further showed that additional restrictions on the choice of weights can reduce the number of potential decomposition rules, and even obtain a unique decomposition rule:

$$s^k = \mathrm{cov}(\mathbf{y}^k, \mathbf{y})/\mathrm{var}(\mathbf{y}). \tag{4}$$

This is the decomposition rule that is based on the squared coefficient of variation inequality index. Fields (2003) reached the same conclusion in a different way. However, Shorrocks (1983) still suggested not relying solely on this decomposition rule in empirical analyses.

It should be noted that the decomposition results do not tell us what happens to inequality if income from a particular source increases. Lerman and Yitzhaki (1985) showed that the relative change in the Gini inequality index following a uniform percentage change in $\mathbf{y}^k$ is $(s^k - \alpha^k)\mathrm{G}(\mathbf{y})$, where α^k is the share of income from source k in the total income. For the general case, Shorrocks (1983) noted that comparing s^k and α^k is useful for knowing whether the kth income source is equalizing or disequalizing.

Morduch and Sicular (2002) and Fields (2003) extended the decomposition procedure (3) to a regression-based decomposition by determinants of income. They expressed household income (or log-income) as

$$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}, \tag{5}$$

where $\mathbf{X}$ is a matrix of explanatory variables, $\boldsymbol{\beta}$ is a vector of coefficients, and $\boldsymbol{\varepsilon}$ is a vector of residuals. Given a vector of consistently estimated coefficients $\mathbf{b}$, income can be expressed as a sum of predicted income and a prediction error according to

$$\mathbf{y} = \mathbf{X}\mathbf{b} + \mathbf{e}. \tag{6}$$

Substituting (6) into (1) and dividing by $I(\mathbf{y})$, the share of inequality attributed to explanatory variable m is obtained as follows:

$$s^m = b_m \Sigma_i a_i(\mathbf{y}) x_i{}^m / I(\mathbf{y}). \tag{7}$$

3. Data

The data were obtained from a farm household survey conducted in 2003 in four rural districts surrounding the capital city of Tbilisi: Dusheti, Mtskheta, Sagarejo, and Gardabani. The survey included a total of 2520 individual farms. In each district, ten villages (Sakrebulos) were selected randomly, and sixty-three households were surveyed in each village using the "random walking" procedure.[2] Hence, the survey is not representative of the farm population in Georgia as a whole, and the results may be relevant for these districts only. The survey collected information about the demographic profile of the household, household income and its sources, land resources and other farm assets, the farming activity and related activities (finances, investments), and social aspects (Kan et al. 2006).

4. Empirical Application and Results

To assess the impact of land reform on income inequality, this section first presents results of inequality decomposition by income sources, and then moves to regression-based decomposition in order to evaluate the impact of explanatory variables, and in particular landholdings, on income inequality.

Income was divided into three main components. Farm income was the largest component, consisting of 44% of total income on average. Non-farm income was the second largest component (35%), about a quarter of which was derived from non-farm businesses and the remaining three quarters from off-farm paid work. Other income (21%) consisted of social assistance payments (about two thirds) and private remittances (about one third). The computation of inequality and its decomposition was performed using per capita annual income, which had a sample mean of GEL 1161, equivalent to USD 531 at the time of the survey.

Table 1 shows the results of inequality decomposition by income sources. It is easy to see that farm income, the main source of income of these households, contributes more than half of the total income inequality among the survey respondents, proportionately more than its income share. On the other hand, non-farm income contributes to inequality less than its income share, and the same is true for other income. These results are consistent across the three decomposition rules. According to the intuition of Shorrocks (1983), this implies that non-farm income is an equalizing source of income. This conclusion can be verified by obtaining the marginal effects on inequality of uniform increases in each of the income sources.[3] In the case of the Gini inequality index, the Lerman and Yitzhaki (1985) formula was used to derive the marginal effects. Since no such formula exists for the other two inequality indices, their marginal effects were computed using simulations. The results are in the bottom part of Table 1. The three inequality indices give qualitatively similar results, confirming the intuitive prediction that a uniform increase in agricultural income increases inequality, while a uniform increase in either non-farm income or other income reduces inequality.

Table 1. Income inequality decompositions for farm households in Georgia.

	Gini	Squared CV	Theil's T
Inequality index	0.4906	1.982	0.4850
Inequality contributions			
Farm income	0.7660	0.8690	0.8833
Non-farm income	0.1757	0.1020	0.0793
Other income	0.0583	0.0290	0.0374
Inequality changes due to a one percent uniform increase in income			
Farm income	0.000352	0.008807	0.001057
Non-farm income	−0.000311	−0.006885	−0.000891
Other income	−0.000040	−0.001922	−0.000164

Notes: All inequality contributions and changes are statistically significant at 1%. Tests of significance are based on bootstrapping.

The fact that agricultural income has the largest contribution to inequality and a positive marginal effect provides a motivation to go further and examine the impact on inequality of the determinants of farm income, and landholdings in particular. For this, we used the regression-based decomposition method of (5)–(7). The variables used to explain per capita income and their descriptive statistics can be seen in Table 2. The age of the head of household and its squared value are included to account for lifecycle effects. Years of schooling are also included, as well as family size. The economic resources of the household are represented by the log of landholdings (in hectares), a dummy for households who raise livestock, and the log of the value of fixed farm assets (in lari). The number of plots of land is included to account for the negative effects of land fragmentation on productivity (Lerman 2005). A dummy variable for the Gardabani region is also included.[4]

Table 2. Explanatory variables and descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max
Age	45.165	11.422	20	89
Schooling (years)	11.735	2.658	0	16
Family size	3.9377	1.5435	1	12
ln(land)	−0.428	1.0158	−4.6	5.95
Number of plots	2.4266	1.299	1	8
Livestock (dummy)	0.8024	0.3983	0	1
ln(farm assets)	8.0428	3.3806	0	13.6
Gardabani region (dummy)	0.25	0.4331	0	1

Table 3 shows the coefficients of the per capita income generating function (6) and the resulting inequality contributions (7). All regression coefficients are statistically significant and most have the expected sign. Age has a non-linear effect, first negative and subsequently positive, on income. This is not a common result. Perhaps income from sources other than labor increases with the age of the head of household or labor income of young household members dominates. Schooling has a positive effect, while family size has a negative effect. Per capita income increases with landholdings but decreases with the number of plots, indicating that land fragmentation is costly, at least in terms of expected income. Income is higher in households that raise livestock and increases with the value of farm assets. Income is higher in the Gardabani region than in the other regions.[5]

Table 3. Regression-based inequality decomposition results.

		Inequality Contribution		
Variable	**Regression Coefficient**	**Gini**	**Squared CV**	**Theil's T**
Intercept	2134.6	0.0000	0.0000	−1.4130
	(4.02) **	(0.08)	(0.45)	(−3.74) **
Age	−69.683	−0.1547	−0.0307	1.8550
	(−3.37) **	(−2.98) **	(−2.23) *	(3.18) **
Age squared	0.742	0.1645	0.0361	−0.8333
	(3.55) **	(3.02) **	(2.15) *	(−3.37) **
Schooling	31.256	0.0022	0.0028	−0.2453
	(2.16) *	(1.04)	(1.80)	(−2.65) **
Family size	−187.8	0.0532	0.0113	0.5686
	(−6.90) **	(4.18) **	(1.73)	(5.08) **
ln(land)	773.1	0.2194	0.1169	0.5621
	(17.52) **	(6.20) **	(4.67) **	(7.17) **
Number of plots	−96.82	−0.0198	−0.0033	0.1378
	(−2.66) **	(−2.10) *	(−1.99) *	(2.04) *
Livestock	687.5	0.0729	0.0170	−0.2780
	(7.06) **	(6.04) **	(4.64) **	(−8.53) **
ln(farm assets)	85.36	0.0165	0.0116	−0.4380
	(14.01) **	(2.43)*	(3.26) **	(−8.32) **
Gardabani region	1291.6	−0.0053	0.0464	−0.1985
	(4.89) **	(−0.45)	(5.15) **	(−9.75) **
Residual		0.6511	0.7921	1.2830
		(22.45) **	(28.43) **	(23.36) **

Notes: There are 2451 "clean" observations. Asymptotic t-values are in parentheses. R^2 = 20.6%. * Coefficient significant at 5%. ** Coefficient significant at 1%.

Turning to the decomposition results, we note that the Gini and squared CV decomposition rules give qualitatively similar results, while the Theil's T decomposition rule gives very different results. For example, the number of plots has a negative inequality contribution under the Gini and squared CV decomposition rule and a positive inequality contribution under the Theil's T decomposition rule. On the other hand, the livestock dummy and the value of farm assets have positive inequality contributions under the Gini and squared CV decomposition rules and negative inequality contributions under the Theil's T decomposition rule. This implies that decomposing an arbitrarily chosen single inequality indicator may be misleading.

The regression residual contributes 65% of income inequality under the Gini decomposition rule and 79% of inequality under the squared CV decomposition rule. The results of the Theil's T decomposition rule are difficult to interpret: the intercept, which has a zero variance in the sample, has a large negative inequality contribution, while the residual has a positive contribution of more than 100%. Interestingly, the sum of the contributions of all explanatory variables under the squared CV decomposition rule amounts to the R^2 of the income regression. Finally, under both the Gini and squared CV decomposition rules, landholdings seem to have the largest contribution to inequality among the explanatory variables. This is consistent with the fact that landholdings are particularly important to farm income and that farm income was found to be an inequality-increasing income source.

It can be claimed that the decomposition results are not too informative because the explanatory variables account for only 21% to 35% of income inequality. However, this is similar to claiming that wage regressions are useless because age and schooling explain only 10% to 20% of wages. In fact, the results are useful in terms of showing how the explained part of income inequality is attributed to the different explanatory variables. The empirical results of Morduch and Sicular (2002) showed a better fit. Cowell and Jenkins (1995) also found that explanatory variables explained a relatively small fraction of income inequality, using two different methodologies.

Using the regression coefficients, it is possible to compute the "income shares" of the explanatory variables as

$$\alpha^m = b_m \Sigma_i x_i{}^m / \Sigma_i y_i, \quad (8)$$

and evaluate the impact on the Gini index of inequality of a uniform increase in an explanatory variable, as in Lerman and Yitzhaki (1985), by computing $(s^m - \alpha^m)\mathrm{G}(\mathbf{y})$. The results are not always interpretable, however, and the logic is similar to the case of marginal effects in non-linear models (i.e., probit). An obvious example is the case of age and age squared: one cannot increase without increasing the other; hence, marginal effects of age alone or age squared alone are meaningless, and one can only use a simulation exercise in which both age and age squared are increased. Another example is a dummy explanatory variable such as livestock or the Gardabani region. These variables can only be changed from zero to one, and hence marginal effects based on percentage changes are meaningless and one has to resort to simulations in this case as well. The meaning of percentage changes in integer explanatory variables such as schooling, family size, and number of plots could also be challenged. The alternative is to use simulations and add one unit to each variable at a time. However, for the case of inequality decompositions, this is not advised, because adding one unit changes not only the size of the variable but also its distribution (in most cases, it would reduce the variance), and hence using percentage changes is the preferred method for these variables. Finally, simulation is also the only way to obtain marginal effects for the case of the squared CV decomposition rule or Theil's T decomposition rule, for which the Lerman and Yitzhaki (1985) formula does not apply.

Therefore, the following simulations are applied to the present empirical example: increasing age, schooling, family size, land, number of plots, and assets by 1% and changing livestock and the Gardabani region from zero to one. The results are in Table 4. The simulated marginal effects are mostly consistent in terms of signs and levels of significance across the three inequality measures, although the absolute sizes are different. In particular, the results imply that a uniform increase in schooling, landholdings, or farm assets reduces income inequality, while a uniform increase in family size or number of plots increases inequality (the effect of the number of plots is slightly short of being statistically significant at 5%). The effect of a uniform increase in age on inequality is not statistically significant. The effects of changing livestock and the Gardabani region from zero to one are negative and very large, implying that one should be careful with interpreting them as marginal effects.

Table 4. Marginal effects of explanatory variables on inequality. [a]

Variable	Gini	Squared CV	Theil's T
Age	0.0006	−0.0008	[b]
	(0.94)	(−0.12)	
Schooling	−0.0015	−0.0153	−0.0031
	(−3.09) **	(−2.86) **	(−3.01) **
Family size	0.0034	0.0316	[b]
	(5.82) **	(5.56) **	
ln(land)	−0.0032	−0.0325	−0.0066
	(−6.57) **	(−4.13) **	(−5.55) **
Number of plots	0.0009	0.0098	0.0019
	(1.84)	(1.66)	(1.78)
Livestock [a]	−0.4434	−6.5080	[b]
	(−5.43) **	(−3.46) **	
ln(farm assets)	−0.0004	−0.0036	−0.0007
	(−5.85) **	(−3.92) **	(−5.05) **
Gardabani region [a]	−0.4227	−4.0300	[b]
	(−9.57) **	(−4.86) **	

Notes: Asymptotic t-values are in parentheses. [a] Marginal effects of livestock and the Gardabani region were computed using the difference in inequality when changing all observations from zero to one. All other variables were increased by 1%. [b] Theil's T marginal effects with respect to age, family size, livestock, and the Gardabani region could not be computed because for some observations, the simulations resulted in negative incomes. ** Coefficient significant at 1%.

It is interesting to note that there is no complete correspondence between the signs of inequality contributions (Table 3) and marginal effects (Table 4). In general, the sign of the marginal effect is opposite to that of the inequality contributions, but this does not hold in all cases.

These results have interesting policy implications. The negative marginal effect of landholdings implies that a uniform increase in landholdings is likely to have an equalizing effect on income. In addition, since the inequality contribution of landholdings is positive, increasing landholdings through a land reform that equalizes landholding distribution is likely to have an even stronger negative impact on income inequality. Similarly, enhancing farm assets through extension of credit to small farmers may also reduce inequality. Note that these last two results hold despite the fact that landholdings and farm assets operate mostly through farm income, which is inequality-increasing.

5. Summary and Conclusions

This paper used methods of inequality decomposition by sources of income, and a regression-based decomposition by determinants of income, in order to assess the potential inequality implications of land reform in four selected districts surrounding the capital city of Georgia. It was found that farm income is a disequalizing source of income among farm households in these regions. This is consistent with the findings of Kai-yuen (1998), Adams (2001), de Janvri and Sadoulet (2001), and Elbers and Lanjouw (2001), but opposite to the results of Chinn (1979), Leones and Feldman (1998), Canagarajah et al. (2001), Estudillo et al. (2001), and Gallup (2002).

In addition, a uniform increase in landholdings or farm assets is expected to reduce inequality. This last result is consistent with the findings of Wan and Zhou (2005) for China, although in their case, the effect was quantitatively small.[6]

Combining the two results, we conclude that the impact of land reform on farm household income inequality depends on the resulting distribution of landholdings. It can reduce inequality if land is distributed relatively equally, or even better, if smallholders are given priority in further land privatization (Lerman 2012), but inequality can increase if the wealthier farmers are able to gain control of more (and perhaps better) land resources. A possible implication of this result is that for land reform to be equalizing, it has to prioritize smallholders over larger farms. Moreover, distributing land to smallholders should be accompanied by additional policies supporting small farmers, such as simple and transparent procedures, with minimum transaction costs, for land titling and registration, as well as support for cooperation and access to credit and other market services. Policies should also guarantee contract enforcement and establish the rule of law.

The consequences of land reform for income inequality depend, therefore, on the particular way in which the reform is implemented. If the continued individualization of farmland could be performed without increasing landholding variability, it is likely that income inequality would go down. If, however, the establishment of land rights that allow land transactions led to land concentration, as has been the case in many other countries (e.g., Colombia, as in Faguet et al. 2018), it could lead to higher production efficiency and growth, but rural income inequality could subsequently rise.

Information on the more recent patterns of land reform in Georgia could help to assess which of these two opposite factors dominates. Lerman (2012) reports that the government in fact changed direction and promoted leasing large plots of state-owned farmland to outside investors rather than allowing small farms to expand. This is likely to have worsened the income situation of smallholders, but it is difficult to predict the effect on inequality without more detailed data. A more recent report (FAO 2020) indicates that land registration has not progressed much in Georgia since the early stages of the land reform, landholdings remain overwhelmingly small (most holdings under 2 Hectares) and even more fragmented, and labor productivity in agriculture is persistently low. Following a policy reform beginning in 2014, farm credit has expanded considerably, but it has mostly favored larger farms, while less than 2% of smallholders have been able to take advantage

of it, possibly contributing to larger income inequality in the farm sector. On the other hand, rural-to-urban migration has increased the flow of remittances to the rural sector. Our results showed that remittances, as part of "other income", are equalizing, and it is likely that income inequality among smallholders is now lower. Still, this news is not too good since smallholders are perhaps more equal but are equally poorer.

To summarize, this study used state-of-the-art inequality decomposition techniques and a careful interpretation of the results to demonstrate an analysis of income inequality in an agrarian economy and its determinants, using rural Georgia as a case study. There are two main disadvantages that limit the applicability of this case study for policy recommendations. First, the sample is not representative of the country as a whole. Second, the data are not very recent and there is no longitudinal dimension. Still, the empirical techniques used can guide future research using more representative and more recent data for Georgia or other countries.

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Conflicts of Interest: The author declares no conflict of interest.

Notes

1 Swinnen et al. (2015) claimed that it is difficult for land reform by itself to achieve agricultural development without accompanying legislation.

2 In principle, the first house in the village is chosen randomly, then the interviewer walks to the end of the street, turns right or left at a toss of a coin, and picks the first house on that street.

3 Kimhi (2011) has shown that using marginal effects is more appropriate than using the pure decomposition results for assessing the inequality increasing or decreasing nature of income components.

4 Other regional dummies, as well as several other explanatory variables (gender, experience, holding an official land document, access to roads, water and electricity), did not come out significant in preliminary regressions and were removed. Their removal did not change the estimation results in a meaningful way, but improved their accuracy.

5 Kimhi (2015) has shown that farms in Gardabani were much smaller than in the other regions, while farm income in Gardabani constituted a larger fraction of total household income. This may indicate that Gardabani farms were more intensive, in terms of either crop specialization or cultivation techniques.

6 Morduch and Sicular (2002) also applied this decomposition technique to Chinese data, but their results were inconclusive with respect to landholdings, as using different inequality measures led to effects of opposite signs, and the effects were not statistically significant.

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