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# Entrepreneurship and Income Inequality in Southern Ethiopia

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**Abstract**

This paper uses inequality decomposition techniques in order to analyse the consequences of entrepreneurial activities to household income inequality in southern Ethiopia. A uniform increase in entrepreneurial income reduces per capita household income inequality. This implies that encouraging rural entrepreneurship may be favourable for both income growth and income distribution. Such policies could be particularly successful if directed at the low-income, low-wealth, and relatively uneducated segments of the society.

Keywords: entrepreneurship, income inequality, redistribution, Ethiopia, Africa

JEL classification: L26, M13, O15, O55



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## 1 Introduction

There is a wide-spread agreement among economists that income inequality rises during early stages of economic growth. This is worrisome for two main reasons. First and foremost, a rise in inequality almost always leads to a rise in poverty, and poverty in developing countries implies hunger and malnutrition. Second, inequality may be harmful for the growth process itself, creating a vicious cycle of underdevelopment and poverty (Galor and Zeira 1993; Deininger and Squire 1998; Aghion et al. 1999). As a result, a wide body of literature was devoted in the last few decades to the analysis of the link between development and inequality (Kimhi 2004). These include theoretical modelling (e.g., Galor 2000; Aghion 2002; Benhabib 2003), as well as empirical studies, the majority of which are aimed at supporting or refuting the Kuznets (1955) inverted-U hypothesis that inequality rises during early stages of development and declines in later stages (Barro 2000; Lundberg and Squire 2003; Banerjee and Duflo 2003). In particular, Deutsch and Silber (2004) show, using a cross-country dataset, that the composition of income by sources affects the association between development and inequality. Specifically, they find that the rising section of the Kuznets curve is mainly caused by an increase in the importance of wage labour income, while the declining section is caused, among other things, by a decrease in the importance of entrepreneurship income. This implies that entrepreneurship is associated with higher income inequality.

Theoretically, the association between entrepreneurship and inequality is not straightforward to predict. While the 'conventional wisdom' has been to associate entrepreneurship with higher inequality, because of the risk embodied in it, Kanbur (1982) shows that this is not necessarily true, and depends, among other things, on the progressivity of the tax regime. Also, Meh (2005) finds that eliminating progressive taxation has a negligible effect on wealth inequality when entrepreneurship is considered but has a large effect when entrepreneurship is omitted. Empirical evidence of US data suggests that entrepreneurship leads to wealth concentration, mostly due to the higher saving rates of entrepreneurs (Quadrini 1999). This is supported by the theoretical models of Meh (2005) and Cagetti and De Nardi (2006), among others. Several researchers (e.g., Rapoport 2002; Naudé 2008) claim that inequality could encourage entrepreneurship in developing countries, but the opposite direction has not been much explored. The purpose of this paper is to analyse the consequences of entrepreneurship to household income inequality in a predominantly subsistence economy in southern Ethiopia, using inequality decomposition techniques applied to household survey data. These techniques are noted to be particularly useful in the case of multiple income sources, which is a common characteristic of agricultural societies (e.g., Arayama, Kim and Kimhi 2006; Kimhi 2007; Morduch and Sicular 2002).

In the higher altitudes of southern Ethiopia, subsistence agriculture is based on the cultivation of *ensete* (false banana), which is used mostly for self-consumption. Labour markets are fairly thin. As a result, entrepreneurial activities are an important source of cash income for the local population. In other parts of Ethiopia, cash crops are important for household welfare (Bigsten et al. 2003). In these densely-populated areas, land is the most limiting factor of production. The allocation of land among households reflects social norms that have been followed over the years, enforced by tradition, by the socialist administration that was in power until 1991, and by the leadership of village chiefs throughout recent history (Kebede 2004). As a result, landholdings, cultivation techniques, and agricultural production are relatively homogeneous across the

population. Despite that, income inequality is surprisingly high (Jayne et al. 2003; van den Berg and Kumbi 2006).

It is observed that elsewhere in Ethiopia, members of farm households engage in low-wage off-farm employment as a response to surplus labour in farming, whereas they engage in self-employment activities in order to earn an attractive return to their qualifications (Woldenhannaa and Oskam 2001). This, coupled with entry barriers to self-employment activities (Dercon and Krishnan 1996), could lead to a positive association between income inequality and entrepreneurship. Therefore, while entrepreneurship should be promoted as a welfare-enhancing household strategy in southern Ethiopia (Carswell 2002), it could also have adverse inequality implications. The policy implications of this argument are clear: while supporting and promoting entrepreneurship in rural areas of developing countries is likely to increase average welfare, it should by no means be considered as a policy that supports the poor (Barrett, Reardon and Webb 2001). Van der Berg and Kumbi (2006) find for Ethiopia that entrepreneurial income is equalizing, but they also report that contradicting results have been obtained for different parts of the country. While the inequality decomposition results from southern Ethiopia may not be directly generalized to developing countries as a whole, studying such a specific case study has its advantages. In particular, entrepreneurial activities are well-specified, and the simplicity of the economy allows one to make direct associations between the results and the basic properties of the economy.

Section 2 of this paper presents the inequality decomposition techniques. The population and the data are described in section 3. The decomposition results are presented in section 4, and in section 5, the effects of income sources on inequality are differentiated by population subgroups. Section 6 provides a brief summary and some concluding remarks and caveats.

## 2 Empirical methodology

The empirical analysis in this paper is based on the method for decomposing income inequality by income sources developed by Shorrocks (1982). He suggests 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 (as functions of the entire income distribution), $y_i$ 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) through by $I(\mathbf{y})$, one obtains the proportional contribution of income source $k$ to overall inequality as:

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

Shorrocks (1982) notes 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: (i) 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 $\mu$ is mean income; (ii) the squared coefficient of variation with $a_i(\mathbf{y}) = (y_i-\mu)/(n\mu^2)$; and (iii) Theil's T index with $a_i(\mathbf{y}) = \ln(y_i/\mu)/n$. Shorrocks (1982) further shows that additional restrictions on the choice of weights can reduce the number of potential decomposition rules, and even obtain a unique decomposition rule, which turns out to be based on the weights related to the squared coefficient of variation inequality index. Fields (2003) reaches the same conclusion in a different way. However, Shorrocks (1983) still suggests not to rely solely on this decomposition rule in empirical analyses. Kimhi (2007) has shown that using the weights related to Theil's T inequality index could produce counter-intuitive results. Hence in this paper we decompose income inequality using the Gini and squared CV decomposition rules.

The existing literature often confuses proportional contributions to inequality and marginal effects, but these are not equivalent terms: the contribution to inequality of an income source reflects its variability and its correlation with total income, and does not inform us what happens to inequality if income from this source increases. In fact, Shorrocks (1983) notes that comparing $s^k$, the proportional contribution to inequality of income source $k$, and $\alpha^k$, the share of income from source $k$ in total income, is useful for knowing whether the $k^{\text{th}}$ income source is equalizing or disequalizing. Lerman and Yitzhaki (1985) show that the relative change in the Gini inequality index following a uniform percentage change in $\mathbf{y}^k$ is $(s^k-\alpha^k)\text{G}(\mathbf{y})$. This is essentially a marginal effect. For other inequality decomposition rules, marginal effects can be obtained by simulating changes in $\mathbf{y}^k$. We use bootstrapping to obtain standard errors for both proportional contributions to inequality and marginal effects.

The shortcoming of the analysis of marginal effects of income sources on inequality is due to the fact that most households do not have income from all sources. For example, only 53 per cent of the households in our sample have income from entrepreneurial activities. The marginal effects refer to a uniform increase in entrepreneurial income, but only for households with positive entrepreneurial income. However, an increase in entrepreneurial income can be a result of increasing the number of entrepreneurs as well. The effect of such an increase on inequality will be denoted as 'extensive marginal effect'. Computing the extensive marginal effects by simulations is complicated by the fact that income from each and every source is likely to change when a household changes status from non-entrepreneur to entrepreneur. Accounting for these changes requires a full set of counterfactual income distributions, which is beyond the scope of this paper. Alternatively, we use a simpler simulation exercise in which we turn an average non-entrepreneur into an average entrepreneur. The simulation exercise is based on the fact that increasing the number of households who have positive income from source $k$ by one per cent is equivalent to increasing total income of households who have positive income from source $k$ by one per cent. In addition, the income of households who have zero income from source $k$ can be decreased by a certain percentage that is equivalent to the percentage by which the number of households who have zero income from source $k$ has to be decreased so as to keep the total number of households constant.

Specifically, the extensive marginal effects are computed in the following way. First, we partition the level of inequality in equation 1 into two subsamples, those who have income from a particular source (+) and those who do not (-):

$$I(\mathbf{y}) = \Sigma_{i+} a_i(\mathbf{y}) y_i + \Sigma_{i-} a_i(\mathbf{y}) y_i \quad (4)$$

Then, we simulate a shift of one per cent of households from the (-) subsample to the (+) subsample, assuming that once a household moves from (-) to (+), its per capita income also changes by the same percentage in which the mean income of (+) is larger than the mean income of (-). Technically, the simulated level of inequality is:

$$I^*(\mathbf{y}) = I(\mathbf{y}) + 0.01\Sigma_{i+} a_i(\mathbf{y}) y_i - x\Sigma_{i-} a_i(\mathbf{y}) y_i, \quad (5)$$

where $x = 0.01\Sigma_{i+} y_i / \Sigma_{i-} y_i$.

This is equivalent to proportionately reducing the inequality weights $a_i(\mathbf{y})$ for all non-entrepreneurs and increasing the weights on entrepreneurs, holding the sum of the weights fixed.

## 3 The population and the data

The data used in this research were collected through a household survey, which was conducted during January-March of 1995 in the Ejana-Wolene, one of the subdistricts of the Guragie administrative zone, in the southern region of Ethiopia. Ejana-Wolene (marked on the map as *Agena*) is a rural area located 240 km south of Addis Ababa, the capital of Ethiopia (Figure 1). According to 1995 district administration records, total population was estimated to be 217,840. *Ensete* (false banana) is the major crop and food source in the region, and is grown by most households on small plots around the house. The cultivation of *ensete* is highly labour-intensive, with men responsible for transplanting and harvesting, and women responsible for further processing and preparation.

Nineteen peasant associations out of the 65 peasant associations in the district were selected for the survey. The selection was based on accessibility and on an attempt to represent the diverse agro-economical conditions of the district. A total of 583 households were surveyed, about 31 in each of the 19 peasant associations (an average peasant association in Guragie includes around 400 households). In each peasant association the households were chosen at random with the assistance of the local chief. An enumerator recorded food intakes of all household members during three consecutive days, and also administered a questionnaire, which included questions about personal and family characteristics, food production and expenditures, income and assets, health, and time allocation. The survey was conducted by a team of researchers from the Hebrew University in Israel, from Tilburg University in The Netherlands, and from The Ethiopian Nutrition Institute. The questionnaire followed closely similar questionnaires that were administered earlier in rural Ethiopia by researchers from The University of Oxford, from IFPRI, and from Addis Ababa University (Dercon and Krishnan 2000; Block and Webb 2001), with some adjustments to the specific nature of Ensete-cultivating households. The data were typed into SPSS files by the staff of the Ethiopian Nutrition Institute, and these files were subsequently modified, by adding variables constructed from the raw data, by researchers from The

Hebrew University and Tilburg University. The data were used in previous research, mostly on health and nutrition, by Kimhi and Sosner (2000) and Kimhi (2006). Five hundred and seventy-one observations (98 per cent) had complete income records and were used in this analysis.

The main income-generating activity of the surveyed population was agricultural production. Each and every household was engaged in the cultivation of *ensete*, and sometimes other secondary crops. Some households were also engaged in raising livestock. These are all traditional activities, and most of their resulting output is intended for self consumption. Entrepreneurial activities, on the other hand, require access to markets and changes in the traditional patterns of time allocation within farming households, and are therefore different in nature from agricultural activities. These include handicrafts, trade and transport (by animals), and are dominated by women, although men who are engaged in these activities have much higher incomes than women (Table 1). It is likely that men spend more time than women on entrepreneurial activities. Men are also considerably more educated than women (Kimhi 2006), and education considerably enhances income from self-employment activities (van der Sluis, van Praag and Vijverberg 2004). Note that Quisumbing and Yohannes (2004) report equal participation rates of men and women in self-employment activities in rural Ethiopia.

Table 1
Entrepreneurship activities and income

| | Males | Females | Total |
|---|---|---|---|
| Number of entrepreneurs[a] | | | |
| Handicrafts | 13 | 89 | 102 |
| Trade | 27 | 52 | 79 |
| Transport | 17 | 129 | 146 |
| Other | 9 | 9 | 18 |
| Total | 66 | 279 | 345 |
| Mean annual income per entrepreneur (birr) | | | |
| Handicrafts | 456 | 193 | 226 |
| Trade | 584 | 213 | 340 |
| Transport | 788 | 134 | 210 |
| Other | 322 | 162 | 242 |
| Total | 576 | 168 | 246 |
| % of total entrepreneurship income | | | |
| Handicrafts | | | 27.44 |
| Trade | | | 31.96 |
| Transport | | | 36.01 |
| Other | | | 4.60 |
| Total | | | 100.00 |

Note: [a] The number of entrepreneurs is larger than the number of entrepreneurial activities because there are cases in which more than one household member is engaged in an entrepreneurial activity.

## 4 Inequality decomposition results and marginal effects

Table 2 shows that agricultural income comprises 51 per cent of per capita household income in the sample, whereas it is responsible for 57 per cent and 38 per cent of total

income inequality, using the Gini and squared CV decomposition rules, respectively. Hence, it is reasonable that the marginal effects of agricultural income will be positive and negative, respectively, on these two decomposition rules. The choice of the decomposition rule matters, then, for the evaluation of a uniform increase in agricultural income. The same is true for hired labour income, which is 11 per cent of total household income, but in this case neither of the marginal effects is statistically significant. Entrepreneurial income, on the other hand, which consists of 17 per cent of household income on average, accounts for only 10 per cent and 8 per cent of income inequality, using the Gini and squared CV decomposition rules, respectively. Consequently, the marginal effects of entrepreneurial income on household income inequality are negative and statistically significant in both cases. Remittances, which comprise 21 per cent of household income on average, have positive but insignificant marginal effects on inequality.

The bottom part of Table 2 shows the extensive marginal effects, i.e., the change in inequality of increasing the number of households that obtain income from labour/entrepreneurship/remittances by 1 per cent. The extensive marginal effects of labour income and remittances are negative and positive, respectively, and are close to

Table 2
Inequality decomposition by income source

| | Share of source-specific per capita income | Inequality measures | |
|---|---|---|---|
| | | Gini | Squared CV |
| Inequality index | | 0.5340 | 1.5817 |
| Inequality contributions | | | |
| Agricultural income | 51% | 0.5683<br>(12.1) | 0.3807<br>(3.87) |
| Hired labour income | 11% | 0.0999<br>(3.04) | 0.1279<br>(1.82) |
| Entrepreneurial income | 17% | 0.1036<br>(4.23) | 0.0830<br>(1.82) |
| Remittances | 21% | 0.2282<br>(4.39) | 0.4084<br>(2.78) |
| Total | 100% | 1.00 | 1.00 |
| Marginal effects | | | |
| Agricultural income | | 0.0594%<br>(2.28) | -0.2693%<br>(-1.46) |
| Hired labour income | | -0.0113%<br>(-0.71) | 0.0280%<br>(0.27) |
| Entrepreneurial income | | -0.0655%<br>(-4.97) | -0.1720%<br>(-2.09) |
| Remittances | | 0.0180%<br>(0.75) | 0.4213%<br>(1.47) |
| Extensive marginal effects | | | |
| Hired labour income | | -0.1434%<br>(-1.47) | -0.2138%<br>(-1.58) |
| Entrepreneurial income | | 0.0081%<br>(0.36) | 0.1333%<br>(0.83) |
| Remittances | | 0.0572%<br>(2.15) | 0.2623%<br>(1.38) |

Note: Bootstrapped t-statistics in parentheses.

being significant. The extensive marginal effects of entrepreneurship are positive but far from being statistically significant. Increasing the number of entrepreneurs, therefore, is not likely to change income inequality in southern Ethiopia. This is at least in part due to the fact that the average incomes of entrepreneurs and non-entrepreneurs are not very different.

To summarize the results thus far, entrepreneurial income is the only income source with marginal effects that are both statistically significant and consistent in sign across the two inequality indices. A uniform increase in entrepreneurial income is expected, therefore, to reduce household income inequality. A direct policy implication is that creating favourable conditions for entrepreneurship in southern Ethiopia (e.g., extending credit to small businesses) could, at the same time, increase average household income and reduce household income inequality. The question is what would be the effect on inequality if the increase in entrepreneurial income is not uniform. The positive inequality contribution of entrepreneurial income implies that a mean-preserving increase in variability of entrepreneurial income is likely to increase inequality. Hence, an increase in entrepreneurial income that also reduces its variability unambiguously reduces household income inequality. However, in the case of an increase in entrepreneurial income that also increases its variability, the two effects go in opposite directions, and the result is ambiguous.

## 5 Differentiating by population subgroups

One shortcoming of the definition of marginal effects is that a uniform increase in income from a certain source is not likely to be observed in reality. With the exception of certain government tax and transfer policies, household income can only be affected indirectly by policies that affect the determinants of income. These policies are not likely to be uniform across the population. For example, labour income may be increased through educational programmes, but the impact of educational programmes is likely to vary by education levels.

To examine whether the sensitivity of inequality to entrepreneurial income varies by population subgroups, the marginal effects of entrepreneurial income were computed again by simulations in which each population subgroup is treated separately. For example, in order to compare marginal effects of female-headed households and male-headed households, we should increase entrepreneurial income of female-headed household by one per cent and compute the marginal effect, and then increase entrepreneurial income of male-headed households by one per cent and compute the marginal effect. Similar simulation exercises can be conducted for population subgroups defined according to other demographic and socioeconomic household characteristics. The simulation results are in Table 3. The second column shows the number of observations in each population subgroup, and the third column shows the mean level of entrepreneurial income in each subgroup. The next two columns give the marginal effects on the Gini and squared CV inequality indices, respectively. All the differences in marginal effects of entrepreneurial income between population subgroups were statistically significant. The results of the relevant tests are in Appendix Table 2.

Table 3
Marginal effects of entrepreneurial income by population subgroups

| Population subgroup | Sample size | Mean income (birr) | Marginal effects (%) | |
|---|---|---|---|---|
| | | | Gini | Squared CV |
| Income quintile | | | | |
| Lowest | 114 | 49.0 | -0.025 | -0.033 |
| | | | (-5.82) | (-4.92) |
| Second | 113 | 96.6 | -0.036 | -0.058 |
| | | | (-6.77) | (-5.04) |
| Third | 113 | 147.0 | -0.032 | -0.076 |
| | | | (-6.65) | (-5.29) |
| Fourth | 114 | 151.7 | -0.008 | -0.060 |
| | | | (-2.87) | (-4.04) |
| Highest | 114 | 341.3 | 0.038 | 0.059 |
| | | | (3.57) | (0.95) |
| Marital status of household head | | | | |
| Single | 63 | 123.2 | -0.0130 | -0.0333 |
| | | | (-3.15) | (-3.40) |
| Not single | 508 | 161.7 | -0.0504 | -0.1322 |
| | | | (-3.72) | (-1.60) |
| Number of children up to 6 | | | | |
| One | 388 | 153.3 | -0.0465 | -0.1386 |
| | | | (-4.61) | (-2.35) |
| More than one | 183 | 166.2 | -0.0168 | -0.0269 |
| | | | (-1.78) | (-0.55) |
| Number of children 7-17 | | | | |
| Up to three | 405 | 131.0 | -0.0597 | -0.1864 |
| | | | (-6.78) | (-4.77) |
| More than three | 166 | 221.9 | -0.0036 | 0.0210 |
| | | | (-0.32) | (0.32) |
| Number of adults | | | | |
| Up to three | 380 | 166.2 | -0.0406 | -0.0945 |
| | | | (-3.16) | (-1.24) |
| More than three | 191 | 140.1 | -0.0228 | -0.0710 |
| | | | (-4.36) | (-3.81) |
| Religion | | | | |
| Muslim | 59 | 94.3 | -0.0059 | -0.0186 |
| | | | (-2.62) | (-2.93) |
| Not Muslim | 512 | 164.7 | -0.0575 | -0.1469 |
| | | | (-4.21) | (-1.76) |
| Household wealth | | | | |
| Up to 1800 birr/person | 353 | 148.1 | -0.0671 | -0.1795 |
| | | | (-8.01) | (-4.96) |
| Over 1800 birr/person | 215 | 173.1 | 0.0038 | 0.0141 |
| | | | (0.34) | (0.21) |
| Age of household head | | | | |
| Under 48 yrs | 324 | 180 | -0.0303 | -0.0657 |
| | | | (-2.42) | (-0.90) |
| More than 48 yrs | 247 | 127.4 | -0.0331 | -0.0998 |
| | | | (-5.39) | (-4.24) |
| Educated adult in the household | | | | |
| Yes | 184 | 198.2 | -0.0117 | 0.0070 |
| | | | (-0.98) | (0.11) |
| No | 387 | 138.1 | -0.0516 | -0.1724 |
| | | | (-6.40) | (-4.67) |
| Total marginal effect of entrepreneurial income | 571 | 157.4 | -0.0655 | -0.1720 |
| | | | (-4.97) | (-2.09) |

Note: Bootstrapped t-statistics in parentheses.

Recall that the overall marginal effects of entrepreneurial income were negative (Table 2). We observe that virtually all subgroup-specific marginal effects are negative, with a few exceptions that are mostly not statistically significant. Differentiating by income quintiles, we find that increasing entrepreneurial income of the lowest 80 per cent of the households is likely to reduce inequality. The marginal effect of entrepreneurial income of the highest income quintile is positive, but statistically significant only in the case of the Gini inequality index. The results in Table 3 further point to several population subgroups in which the marginal effects are larger in absolute value. However, there is no clear association between the size of the marginal effect and the level of entrepreneurial income. For example, marginal effects are smaller in absolute value among single-headed households and among Muslim households, that have lower levels of entrepreneurial income, but also among wealthier households and among more educated households, that have higher levels of entrepreneurial income. Marginal effects of entrepreneurial income are also larger in absolute value among households with fewer children (and lower levels of entrepreneurial income). However, the absolute value of the marginal effect seems to be associated with the size of the population subgroup: single-parent households, Muslim households, more educated households and wealthier households are all smaller than the complementary population subgroups, while households with fewer children are the majority. Overall, despite the fact that the marginal effects of different population subgroups are different in magnitude, they are almost always negative. This leads one to conclude that the overall marginal effects reflect changes in inequality within the population subgroups more than between them.

It should be noted that regression-based inequality decomposition techniques, suggested by Fields (2003) and by Morduch and Sicular (2002), are preferred for examining the impact of population characteristics on inequality. However, estimating the income-generating equations turned out to be highly unsatisfactory (in particular, household wealth explained almost all of the explained variation in per capita income) in our case, and therefore we do not present these results.

## 6 Summary and conclusions

In this paper, inequality decomposition techniques were used in order to analyse the consequences of entrepreneurial activities to household income inequality in southern Ethiopia. Household income inequality was first decomposed by income sources, and marginal effects of each income source on inequality were derived. Then we differentiated the marginal effects of income sources on inequality by population subgroups. We found that a uniform increase in entrepreneurial income reduces per-capita household income inequality. This implies that encouraging rural entrepreneurship may be favourable for both income growth and income distribution. However, increasing the number of entrepreneurs does not affect inequality. By differentiation of the marginal effects by population subgroups, we found that entrepreneurship-supporting policies could be particularly successful in reducing inequality if directed at the low-income, low-wealth, and relatively uneducated segments of the society.

Several caveats are worth mentioning. First, computing income from agriculture involved some imputations, and the sensitivity checks reported in Appendix 1 showed

that the decomposition results are somewhat sensitive to the imputation methods. Second, the Gini and squared CV decomposition rules gave contradictory results in several cases. However, in all cases the qualitative result that entrepreneurial activities reduce inequality has not changed, and therefore one can be quite confident about it. Whether this result can be generalized is not clear, because of the specificity of our research population. However, studies in other countries, e.g., Vietnam (Oostendorp et al. 2009) have reached similar conclusions. Still, this study should be replicated in other countries or regions in order to assess this issue.

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## Appendix 1: sensitivity analysis

Computing household income from agricultural activities was complicated by two main issues. First, most of the agricultural output was used for household consumption, and hence the value of output had to be imputed. This is further complicated by the fact that the quantity of output was reported in many different local units of weight, volume, etc. Second, labour is the dominant factor of production, and in most cases hired workers are either paid in kind or work as part of a labour sharing arrangement, without explicit compensation.

To deal with the computation of output, we used three different methods. First, we converted all units of output to kilograms and then used price per kilogram of each type of output, derived as a village-level median of all available price data. Second, we used similarly-derived prices per each unit of measurement for each type of output, and then aggregated the values. Third, we used prices obtained from administrative officials, which were available for about half of the agricultural activities reported. For the other cases, we used prices derived by the first method. The results show that income inequality is higher when using the second imputation method, while the first and the third methods yield roughly similar inequality results. In addition, the contribution of agricultural income to inequality is lower when using the second imputation method, while the marginal effect of entrepreneurial income is larger in absolute value.

To deal with the computation of labour input, we used four different methods. First, we used median levels of wages in each village. To check the sensitivity of the results to this method, we also imputed wages that are one birr above and below the median. Finally, we used the actual wages when those were reported, and imputed wages that were not reported using the median. The results show that using wages above (below) the median results in higher (lower) income inequality. Using actual wages (fourth method) also results in lower inequality. The changes in the decomposition results are relatively small. The changes in the marginal effects are somewhat larger, with marginal effects of the second and third methods generally larger and smaller in absolute value, respectively.

As a final sensitivity check, we excluded the costs of the three labour activities that involve mostly labour-sharing arrangements. This resulted in higher agricultural income and lower income inequality, but the inequality decomposition results changed only slightly. Marginal effects did change considerably, though. For example, marginal affects of agricultural income on the Gini inequality index changed from positive and mostly significant to negative but insignificant. Marginal effects of entrepreneurial income on the Gini (squared CV) inequality index became larger (smaller) in absolute value, while marginal effects of remittance income became larger for both inequality indices.

Regardless of the sensitivity of the results to the computation of agricultural income, it should be emphasized that the marginal effects of entrepreneurial income on inequality remained negative regardless of the method chosen for imputing prices or wages.

Appendix Table A-1
Sensitivity analysis of entrepreneurial income inequality contributions and intensive marginal effects

| | Gini | | | | | Squared CV | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price/ wage | Index | Contr. | t-val | Marg. | t-val | Index | Contr. | t-val | Marg. | t-val |
| A/1 | 0.5340 | 0.1036 | 4.23 | -0.0655 | -4.97 | 1.5817 | 0.0830 | 1.82 | -0.1720 | -2.09 |
| A/2 | 0.5774 | 0.0988 | 4.09 | -0.0829 | -6.35 | 1.8352 | 0.0769 | 1.89 | -0.2101 | -2.93 |
| A/3 | 0.4982 | 0.1044 | 4.12 | -0.0537 | -4.11 | 1.3826 | 0.0865 | 1.85 | -0.1450 | -1.75 |
| A/4 | 0.5186 | 0.1029 | 4.17 | -0.0616 | -4.44 | 1.4989 | 0.0842 | 1.86 | -0.1628 | -1.97 |
| B/1 | 0.6875 | 0.1673 | 4.85 | -0.1076 | -7.40 | 3.3639 | 0.1105 | 2.01 | -0.3282 | -3.02 |
| B/2 | 0.7895 | 0.1632 | 4.75 | -0.1487 | -8.14 | 4.3334 | 0.1138 | 1.74 | -0.3895 | -2.73 |
| B/3 | 0.6097 | 0.1701 | 4.85 | -0.0770 | -5.03 | 2.6926 | 0.1081 | 1.92 | -0.2770 | -2.62 |
| B/4 | 0.6557 | 0.1666 | 5.03 | -0.0961 | -6.68 | 3.0932 | 0.1064 | 1.88 | -0.3112 | -2.77 |
| C/1 | 0.5261 | 0.1096 | 4.17 | -0.0597 | -4.18 | 1.5970 | 0.0846 | 1.99 | -0.1708 | -2.13 |
| C/2 | 0.5696 | 0.1071 | 4.91 | -0.0740 | -6.64 | 1.8573 | 0.0823 | 2.07 | -0.2001 | -2.56 |
| C/3 | 0.4902 | 0.1139 | 4.70 | -0.0464 | -3.61 | 1.3932 | 0.0892 | 2.22 | -0.1426 | -2.03 |
| C/4 | 0.5106 | 0.1154 | 3.82 | -0.0531 | -3.69 | 1.5121 | 0.0892 | 1.84 | -0.1582 | -1.97 |

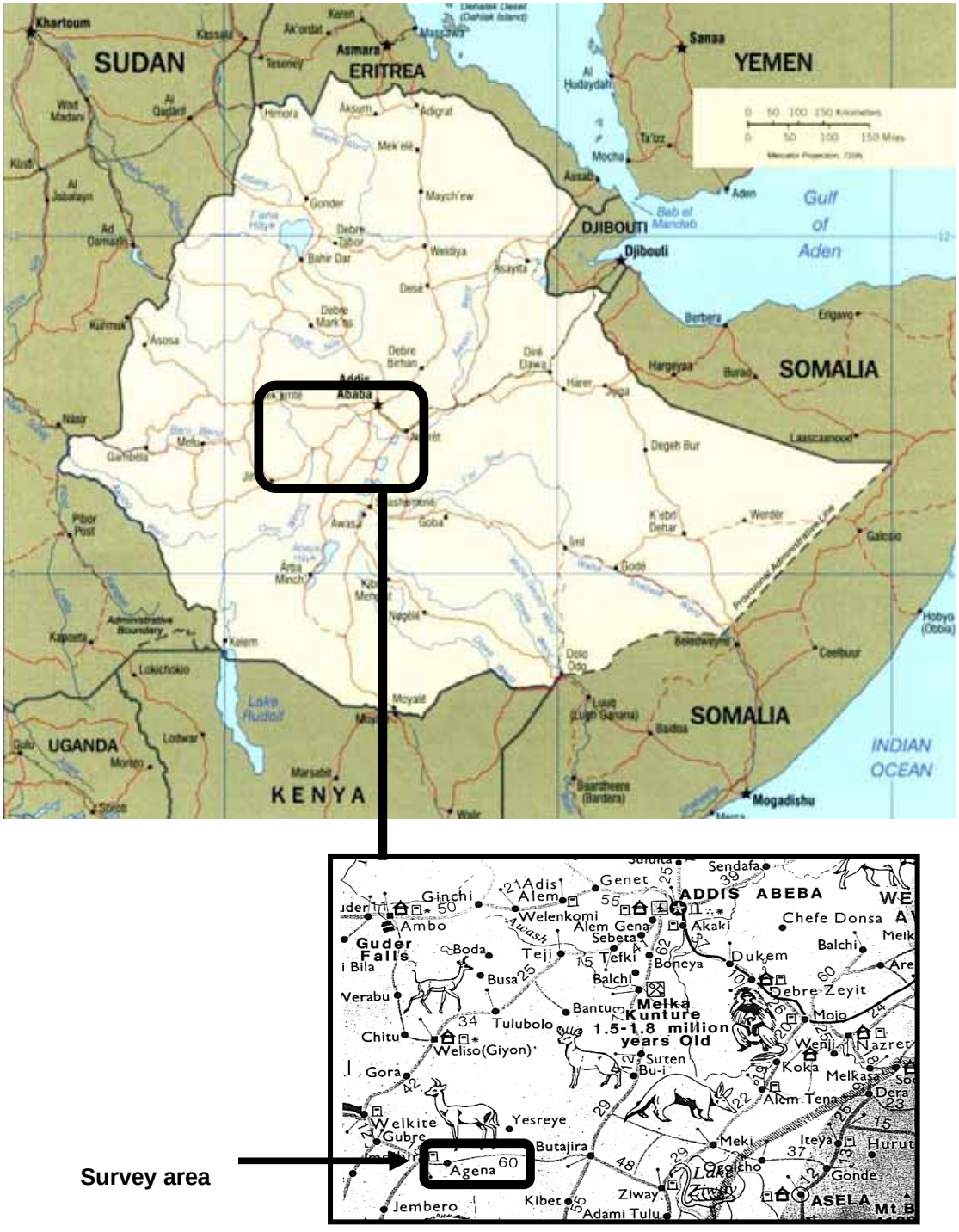
Note: The price index A, B, C refer to the three methods of output price imputation; the wage index 1, 2, 3, 4 refer to the four methods of hired labour wage imputation.

Appendix Table A-2
Tests of different marginal effects of entrepreneurial income by population subgroups

| | Gini | | Squared CV | |
|---|---|---|---|---|
| Subgroup definition | statistic | significance | statistic | significance |
| Income quintile | 4468.75 | 0.00 | 497.63 | 0.00 |
| Marital status of household head | 42.52 | 0.00 | 21.34 | 0.00 |
| Number of children up to 6 | -28.88 | 0.00 | -21.62 | 0.00 |
| Number of children 7-17 | -52.73 | 0.00 | -46.78 | 0.00 |
| Number of adults | 19.97 | 0.00 | 6.53 | 0.00 |
| Religion | 58.69 | 0.00 | 26.38 | 0.00 |
| Household wealth | -66.65 | 0.00 | -45.33 | 0.00 |
| Age of household head | 2.54 | 0.01 | 6.44 | 0.00 |
| Educated adult in the household | 37.47 | 0.00 | 39.89 | 0.00 |

Note: F statistics are reported for the case of income quintiles, t statistics in all other cases.

Figure 1
Map of Ethiopia and survey area




Source: Kimhi (2006).