Testing Efficient Risk Sharing with Heterogeneous Risk Preferences: Comment

By Aditya Shrinivas and Marcel Fafchamps*

Mazzocco and Saini (2012) propose and implement a test of efficient risk sharing that allows for preference heterogeneity. They motivate their approach as yielding different results from those of standard efficiency test with homogeneous preferences. We show that the standard efficiency test results are misreported in their paper and that the correctly reported results do not present as compelling a case for the importance of accounting for heterogeneous preferences.

Mazzocco and Saini (2012) (hereafter MS) propose a test of efficient risk sharing that allows for preference heterogeneity. They motivate their approach as yielding a different inference from what is obtained with a standard homogeneous preference test:

$$\Delta\rho_t^i = \alpha_0 + \alpha_1 X_t + \alpha_2 \Delta\rho_t^a + \alpha_3 \Delta y_t^i \tag{1}$$

where $\Delta\rho_t^i, \Delta\rho_t^a$ and Δy_t^i are the first difference in household expenditure, village expenditure, and household income, respectively, and where X_t is a vector of control variables. MS apply this test both at the village and caste level using data from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). The test results reported by MS reject efficiency in risk sharing at the village level and for all caste groups in all three villages. The authors contend that this rejection, also found in other studies (Cochrane, 1991; Mace, 1991; Townsend, 1994; Attanasio and Davis, 1996; Hayashi, Altonji and Kotlikoff, 1996), may be spurious because they assume identical preferences. As a solution, MS propose a new non-parametric test that allows for heterogeneous preferences. Other studies have proposed tests of efficient risk sharing with heterogeneous preferences (Schulhofer-Wohl, 2011; Chiappori et al., 2014; Laczó, 2015). The novelty of MS's approach is that it is non-parametric and allows for a general class of utility functions. Using their new method, MS show that efficiency in risk sharing is not rejected for most castes, but it is rejected at the village level. The authors claim that non-rejection of efficiency at the caste level demonstrates the usefulness of their method, since it was obtained only after accounting for heterogeneous preferences.

Using MS's data to reproduce their study, we find that test results with homogeneous preferences are misreported. The estimated coefficients presented as the

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"coefficients on non-labor income" in Table 3 (p. 455) are in fact the coefficients on village expenditure and not the coefficients on non-labor income. The authors shared with us the first version of the paper that they submitted to this journal. This makes clear that the mistake crept up during their resubmission. Table 1 lays side by side the test results reported in the published article, those in the first submitted version of the paper, and our replication of MS using their original data. By comparing the first three sets of results, it is apparent that the "coefficient on non-labor income" presented in MS's published paper is in fact the coefficient on village expenditure. We would like to thank MS for their courtesy in sharing their data and code. MS acknowledge this error in their Erratum (Mazzocco and Saini, 2017).

We also discovered a data manipulation error. For the efficiency test at the caste level to be valid, variable $\Delta\rho_t^a$ in model (1) should measure expenditures averaged at the caste level; the authors use average village expenditure instead - something MS recognize in their recently published Erratum. Correcting for this error increases the coefficients on caste expenditure, as shown in the last two columns of Table 1. Overall, these corrections reduce the coefficient on non-labor income which, as a result, loses statistical significance in a number of cases.

Table 2 summarizes how the number of rejections of standard risk sharing at the caste level decreases as we correct for these data errors. Since 13 hypothesis tests are performed across all village-caste groups, there remains the issue of multiple testing. Indeed, under the null of efficient risk sharing, the probability of observing *no* rejection at the 10% level over 13 independent tests is only 25.4%. As reported in the last column of Table 2, only 1 out of 13 tests at the caste level survive a Bonferroni correction for multiple testing. This shows that the number of rejections of efficient risk sharing is smaller than reported by MS, but remains significant for some castes.

Another issue that requires attention, while not an error in MS, is that the coefficient on village/caste expenditure may mechanically equate to unity if the sample is large enough.This is indeed what is apparent from the corrected results reported in last two columns of Table 1. Most studies on risk sharing have avoided using village consumption as a regressor. Deaton (1990) and Ravallion and Chaudhuri (1997) use village fixed effects, Townsend (1994) uses the deviation of household consumption from the village average as dependent variable, and Suri (2011) uses a contrast estimator derived from the peer-effects literature. To illustrate how this affects inference about risk sharing, we report in Table 3 results from risk sharing tests using the three approaches proposed by the above authors. Only income coefficients that are significantly positive are regarded as rejection of full risk sharing. Each specification is presented in detail in Appendix A. Table 3 also summarizes, for each of the three test specifications, results for three different consumption categories. All reported results in Table 3 correct for multiple testing. Detailed coefficient estimates are provided in Appendix Tables A1-A3. Findings are generally consistent with those of MS, except that efficient risk sharing is rejected slightly less frequently for grain and food and for the method of Suri.

Table 1—: Replication of Standard Test of Efficient Risk Sharing

	MS (published)		MS (first version)		Replication results: Correct mislabelling of coefficients		Replication results: Fix data-manupulation error		
	Coefficient on nonlabor income	N	Coefficient on nonlabor income	N	Coefficient on Village Expenditure	Coefficient on nonlabor income	Coefficient on Village/Caste Expenditure	Coefficient on nonlabor income	N
AUREPALLE									
All households	0.261**	3635	0.014**	2822	0.259***	0.017***	0.259***	**0.017*** **	3635
	(0.018)		(0.005)		(0.018)	(0.004)	(0.018)	**(0.004)**	
By caste									
Rank = 7.5	0.191**	589	0.075	582	0.191***	0.015	0.751***	-0.084	589
	(0.043)		(0.062)		(0.043)	(0.168)	(0.053)	(0.147)	
Rank = 18.75	0.447**	238	0.032	217	0.446***	-0.085	0.945***	-0.021	238
	(0.105)		(0.032)		(0.105)	(0.171)	(0.068)	(0.131)	
Rank = 30	0.190**	595	0.038	493	0.190***	0.074***	0.925***	0.025	595
	(0.030)		(0.030)		(0.030)	(0.027)	(0.046)	(0.021)	
Rank = 55	0.258**	944	0.038**	763	0.258***	0.033**	0.890***	0.030***	944
	(0.039)		(0.019)		(0.039)	(0.013)	(0.052)	(0.012)	
Rank = 86.25	0.197**	595	0.012*	541	0.197***	0.017***	1.007***	0.006*	595
	(0.029)		(0.007)		(0.029)	(0.004)	(0.057)	(0.003)	
Rank = 97.5	0.264**	238	-0.004	170	0.264***	0.008	0.981***	-0.001	238
	(0.041)		(0.011)		(0.041)	(0.006)	(0.050)	(0.004)	
SHIRAPUR									
All households	0.207**	3242	0.011***	2537	0.208***	0.009***	0.208***	**0.009*** **	3243
	(0.026)		(0.003)		(0.026)	(0.003)	(0.026)	**(0.003)**	
By caste									
Rank = 5	0.124**	423	-0.019	378	0.124**	0.477***	0.600***	**0.478*** **	423
	(0.054)		(0.034)		(0.054)	(0.108)	(0.059)	**(0.097)**	
Rank = 23.75	0.280**	819	0.012**	733	0.278***	0.013***	0.603***	0.010**	818
	(0.046)		(0.005)		(0.046)	(0.004)	(0.055)	(0.004)	
Rank = 72.5	0.184**	1574	0.011**	1426	0.183***	0.006*	0.569***	0.004	1576
	(0.040)		(0.004)		(0.040)	(0.004)	(0.056)	(0.003)	
KANZARA									
All households	0.304**	3677	0.020**	2565	0.304***	0.009*	0.304***	0.009*	3677
	(0.023)		(0.004)		(0.023)	(0.005)	(0.023)	(0.005)	
By caste									
Rank = 11.25	0.336**	611	0.009	558	0.336***	0.016	0.629***	0.008	611
	(0.065)		(0.017)		(0.065)	(0.014)	(0.046)	(0.012)	
Rank = 55	0.263**	1376	0.023**	1240	0.264***	0.033**	0.789***	0.031**	1376
	(0.039)		(0.010)		(0.039)	(0.015)	(0.033)	(0.013)	
Rank = 76.25	0.381**	321	0.030**	258	0.381***	0.003	0.908***	0.004	321
	(0.069)		(0.008)		(0.069)	(0.007)	(0.059)	(0.006)	
Rank = 91.25	0.324**	738	0.002	479	0.324***	0.005	0.710***	0.005	738
	(0.042)		(0.007)		(0.042)	(0.006)	(0.055)	(0.006)	

Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. Coefficients that are significant at the 10% level after Bonferroni correction appear in bold. The Bonferroni corrected p-value at the 10% level is 0.033 for 3 villages and 0.0077 for 13 castes. Sources: MS (published) is from Table 3 in (Mazzocco and Saini, 2012, p. 455). MS (first version) is from Table 6 in the first version of Mazzocco and Saini (2012) that was submitted to this journal. Replication results are from our own calculations using the data posted by Mazzocco and Saini on the AER website : https://www.aeaweb.org/aer/data/feb2012/20080801_data.zip. Column "Correct for mislabelling coefficients" is a copy and paste of the replication results with the correct labels.

Table 2—: Summary of Replication of Standard Test of Efficient Risk Sharing

Using each test, how often is risk sharing rejected at the 10% level	MS (published)	Correct mislabelling of coefficients	Fix Data Manipulation Error	With Bonferroni Correction
Village level	3/3	3/3	3/3	2/3
Caste level	13/13	7/13	5/13	1/13

Table 3—: Sensitivity of the standard test of efficient risk sharing to testing method and consumption category

	MS	Townsend	Deaton	Suri
Panel A : Total Expenditure				
Village	2/3	1/3	1/3	1/3
Castes all	1/13	2/13	1/13	0/13
Castes with heterogeneous preferences	1/8	1/8	1/8	0/8
Panel B : Expenditure (No leisure)				
Village	2/3	2/3	2/3	0/3
Castes all	0/13	0/13	1/13	0/13
Castes with heterogeneous preferences	0/8	0/8	1/8	0/8
Panel C: Grain and Food only				
Village	1/3	1/3	1/3	0/3
Castes all	0/13	0/13	0/13	0/13
Castes with heterogeneous preferences	0/8	0/8	0/8	0/8

Notes: The results reported in the table are all based on data corrected for manipulation errors. Only income coefficients that are significantly positive are counted as rejection of full risk sharing. In Panel A, Expenditure = Grain+Food+Non-durables+Leisure. In Panel B, Expenditure=Grain+Food+Non-durables. In Panel C, Expenditure = Grain and Food only. Townsend: pooled panel, dependent variable is deviation from village/caste average; Deaton: using time dummies for each village or caste; Suri: non-linear test using the contrast estimator.The above results are all corrected for mutiple testing. The Bonferroni corrected p-value at the 10% level is 0.033 for 3 villages; 0.0077 for 13 castes and 0.0125 for the 8 castes with heterogeneous preferences.

As derived in Proposition 1 in MS, these findings may be spurious as the income coefficient in the standard risk sharing test is biased upwards if risk preferences are heterogeneous. Results from the test of homogeneity in risk preferences in MS, reproduced in Appendix Table A4, show that homogeneity is rejected for only eight of the thirteen castes. Hence, we should be concerned about spurious rejections for the subset of eight castes with heterogeneous preferences. At the bottom of each panel in Table 3 we report standard risk sharing tests for only those eight castes. We find that efficient risk sharing is only rejected for one caste. This means that spurious inference due to heterogeneous risk preferences can only have affected at most one caste out of 13.

To summarize, we have shown that, when properly implemented, efficiency test under homogeneous preferences are largely similar to those reported under heterogeneous preferences by MS: efficiency in risk sharing is rejected at the village level for all three villages, but not for many of the castes. The non-rejection of efficiency for certain castes, irrespective of whether one allows for heterogeneous preferences, is consistent with other studies that strengthen arguments for moving away from the village as the natural level to organize informal insurance (Grimard, 1997; Fafchamps and Lund, 2003; De Weerdt and Dercon, 2006; De Weerdt and Fafchamps, 2011). But it does not present as compelling a case for the importance of accounting for heterogeneity. When suitably corrected, standard tests do not yield results that are markedly different from those provided by the heterogeneity-robust test of MS.

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Appendix A

Townsend (1994) circumvents the mechanical computation problem by imposing a coefficient of one on the village consumption variable in the pooled panel:

$$\Delta\left(C_{it}-\bar{C}_t\right)=\alpha_0+\alpha_1 X_{it}+\alpha_3\Delta Y_{it} \tag{A1}$$

where C_{it} is the adult equivalent consumption in household i; $\bar{C}_t$ is the village average consumption per adult equivalent; Y_{it} is the household income per adult equivalent and X_{it} is a vector of control variables.

Ravallion and Chaudhuri (1997) avoid using village consumption altogether and instead use time-fixed effects:

$$\Delta C_{it}=\alpha_0+\eta_t+\alpha_1 X_{it}+\alpha_3\Delta Y_{it} \tag{A2}$$

where η_t are year fixed effects for each village that control for aggregate village consumption. This is similar to the village-fixed effects in Deaton (1990). We replicate Deaton's method by using month-fixed effects for each village/caste, to ensure comparability with the monthly data used in MS.

Suri (2011) addresses the mechanical estimation problem by using a contrast estimator derived from the peer effects literature (see Boozer and Cacciola (2001)). By comparing the village-fixed effects specification (within village) :

$$\Delta C_{it}=\alpha_0+\eta_t+\alpha_1 X_{it}+\alpha^W\Delta Y_{it} \tag{A3}$$

and the average village specification (between village) :

$$\Delta\bar{C}_t=\alpha_0+\alpha^B\Delta\bar{Y}_t \tag{A4}$$

where η_t are month fixed effects for each village and $\bar{Y}_{it}$ is village average income per adult equivalent, Suri shows that the contrast estimator:

$$\hat{\beta}=1-\frac{\alpha^W}{\alpha^B} \tag{A5}$$

is a measure of the extent of risk sharing. The test of full risk sharing is a test whether the contrast estimator $\hat{\beta}=1$ and the test of zero risk sharing is $\hat{\beta}=0$.

In Appendix Tables A1, A2 and A3, we report the coefficient estimates from the above specifications for each village and caste and for three different consumption categories. For the Townsend and Deaton tests, we report the coefficient on income α_3 and for Suri's test, we report the coefficient on the between estimate α^B, the contrast estimator $\hat{\beta}$, the p-values of the non-linear test that $\hat{\beta}=1$ and that for $\hat{\beta}=0$. Note that, the coefficient on income α_3 in Deaton's test is the same as the coefficient on the within estimate α^W in Suri's test.

Table A1—: Replication of standard test of efficient risk sharing using Total expenditure and different testing methods

	MS		Townsend	Deaton	Suri				
	Coefficient on village/caste expenditure	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on village/caste nonlabor income	Contrast Estimator	Test of full risk sharing [p-value]	Test of zero risk sharing [p-value]	N
AUREPALLE									
All households	0.259***	**0.017*** **	**0.015*** **	**0.019*** **	0.033***	0.438***	**0.000**	0.006	3635
	(0.018)	**(0.004)**	**(0.004)**	**(0.004)**	(0.005)	(0.160)			
By caste									
Rank = 7.5	0.751***	-0.084	0.045	0.019	1.157***	0.983***	0.918	0.000	589
	(0.053)	(0.147)	(0.145)	(0.178)	(0.180)	(0.160)			
Rank = 18.75	0.945***	-0.021	-0.019	-0.044	-0.168	0.736	0.842	0.577	238
	(0.068)	(0.131)	(0.126)	(0.272)	(0.164)	(1.320)			
Rank = 30	0.925***	0.025	0.021	0.036	0.160***	0.773***	0.323	0.001	595
	(0.046)	(0.021)	(0.021)	(0.029)	(0.033)	(0.230)			
Rank = 55	0.890***	*0.030*** *	**0.033*** **	*0.036** *	0.036**	0.001	0.111	0.999	944
	(0.052)	*(0.012)*	**(0.011)**	*(0.014)*	(0.014)	(0.626)			
Rank = 86.25	1.007***	0.006*	0.005	0.011**	0.026***	0.556***	*0.012*	0.002	595
	(0.057)	(0.003)	(0.003)	(0.005)	(0.003)	(0.176)			
Rank = 97.5	0.981***	-0.001	-0.002	-0.004	0.020***	1.197***	0.448	0.000	238
	(0.050)	(0.004)	(0.004)	(0.011)	(0.007)	(0.259)			
SHIRAPUR									
All households	0.208***	**0.009*** **	0.003	0.004	0.066***	0.941***	0.159	0.000	3243
	(0.026)	**(0.003)**	(0.003)	(0.003)	(0.002)	(0.042)			
By caste									
Rank = 5	0.600***	**0.478*** **	**0.261*** **	**0.440*** **	0.261*	-0.685	0.340	0.698	423
	(0.059)	**(0.097)**	**(0.094)**	**(0.137)**	(0.135)	(1.765)			
Rank = 23.75	0.603***	0.010**	0.006	0.008*	0.039***	0.785***	0.153	0.000	818
	(0.055)	(0.004)	(0.004)	(0.005)	(0.006)	(0.150)			
Rank = 72.5	0.569***	0.004	0.000	0.000	0.040***	0.994***	0.908	0.000	1576
	(0.056)	(0.003)	(0.003)	(0.004)	(0.004)	(0.049)			
KANZARA									
All households	0.304***	0.009*	0.009**	0.009*	0.029***	0.701***	0.098	0.000	3677
	(0.023)	(0.005)	(0.004)	(0.005)	(0.006)	(0.181)			
By caste									
Rank = 11.25	0.629***	0.008	0.003	0.004	0.063**	0.933***	0.843	0.006	611
	(0.046)	(0.012)	(0.012)	(0.014)	(0.026)	(0.338)			
Rank = 55	0.789***	0.031**	0.027**	0.030**	-0.023	2.299	0.446	0.177	1376
	(0.033)	(0.013)	(0.013)	(0.015)	(0.025)	(1.704)			
Rank = 76.25	0.908***	0.004	0.003	0.006	0.013	0.514	0.466	0.442	321
	(0.059)	(0.006)	(0.006)	(0.009)	(0.008)	(0.667)			
Rank = 91.25	0.710***	0.005	0.005	0.004	0.026***	0.843***	0.568	0.002	738
	(0.055)	(0.006)	(0.006)	(0.007)	(0.008)	(0.274)			

Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. The measure of consumption (the dependent variable) is the sum of the value of grain, food, nondurables and imputed lesiure all in units of 1975 Rupees per adult equivalent per month. The results reported in the table are all based on data corrected for manipulation errors. Only income coefficients that are significantly positive are regarded as rejection of full risk sharing. Townsend: pooled panel, dependent variable is deviation from village/caste average; Deaton: using time dummies for each village or caste; Suri: coefficient on village/caste nonlabor income is the between estimate and the non-linear test for full risk sharing is whether the contrast estimator $\hat{\beta} = 1$ and the test of zero risk sharing is $\hat{\beta} = 0$. The Bonferroni corrected p-value at the 10% level is 0.033 for 3 villages; 0.0077 for 13 castes and 0.0125 for the 8 castes with heterogeneous preferences. Coefficients that are significant at the 10% level after Bonferroni correction for the 3 villages and 13 castes appear in bold and those for 8 castes with heterogeneous preferences appear in italic.

Table A2—: Replication of standard test of efficient risk sharing using Expenditure(No Leisure) and different testing methods

	MS		Townsend	Deaton	Suri				N
	Coefficient on village/caste expenditure	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on village/caste nonlabor income	Contrast Estimator	Test of full risk sharing [p-value]	Test of zero risk sharing [p-value]	
AUREPALLE									
All households	0.997***	**0.008*** **	**0.008*** **	**0.009*** **	0.003**	-1.717	0.043	0.200	
	(0.068)	**(0.002)**	**(0.002)**	**(0.003)**	(0.002)	(1.341)			
By caste									
Rank = 7.5	1.012***	-0.029***	-0.029***	-0.038***	0.046***	1.810***	0.069	0.000	
	(0.048)	(0.009)	(0.009)	(0.011)	(0.015)	(0.445)			
Rank = 18.75	0.999***	0.002	0.002	0.005	0.021*	0.746	0.665	0.204	
	(0.056)	(0.008)	(0.008)	(0.017)	(0.011)	(0.587)			
Rank = 30	1.004***	-0.003	-0.003	-0.005	0.028***	1.164***	0.614	0.000	
	(0.050)	(0.004)	(0.004)	(0.006)	(0.006)	(0.325)			
Rank = 55	1.000***	0.005	0.005	0.006	-0.004	2.606	0.519	0.296	
	(0.046)	(0.003)	(0.003)	(0.004)	(0.004)	(2.493)			
Rank = 86.25	0.964***	0.005**	0.005**	**0.010*** **	0.013***	0.236	0.013	0.444	
	(0.070)	(0.002)	(0.002)	**(0.004)**	(0.002)	(0.309)			
Rank = 97.5	1.001***	0.002	0.002	0.004	-0.000	18.719	0.980	0.978	
	(0.061)	(0.006)	(0.006)	(0.016)	(0.008)	(690.104)			
SHIRAPUR									
All households	0.995***	0.001	0.001	0.001	0.011***	0.944***	0.476	0.000	
	(0.051)	(0.001)	(0.001)	(0.001)	(0.001)	(0.078)			
By caste									
Rank = 5	0.994***	0.017	0.017	0.026	0.033*	0.229	0.226	0.718	
	(0.053)	(0.012)	(0.012)	(0.018)	(0.018)	(0.636)			
Rank = 23.75	0.988***	0.003**	0.003**	*0.004****	0.006***	0.415	0.066	0.193	
	(0.063)	(0.001)	(0.001)	*(0.001)*	(0.001)	(0.319)			
Rank = 72.5	0.989***	-0.000	-0.000	-0.000	0.008***	1.046***	0.631	0.000	
	(0.060)	(0.001)	(0.001)	(0.001)	(0.001)	(0.095)			
KANZARA									
All households	0.997***	**0.003** **	**0.003** **	**0.004** **	0.020***	0.826***	0.095	0.000	
	(0.037)	**(0.001)**	**(0.001)**	**(0.001)**	(0.002)	(0.104)			
By caste									
Rank = 11.25	1.022***	-0.005	-0.005	-0.006	0.006	1.979**	0.263	0.024	
	(0.067)	(0.003)	(0.003)	(0.004)	(0.005)	(0.875)			
Rank = 55	0.997***	0.004	0.004	0.005	-0.002	3.006	0.603	0.436	
	(0.043)	(0.003)	(0.003)	(0.004)	(0.005)	(3.855)			
Rank = 76.25	0.996***	0.001	0.000	0.000	0.011***	0.959***	0.874	0.000	
	(0.072)	(0.003)	(0.003)	(0.004)	(0.003)	(0.258)			
Rank = 91.25	0.981***	0.005	0.005	0.006*	0.027***	0.776***	0.146	0.000	
	(0.068)	(0.003)	(0.003)	(0.004)	(0.003)	(0.154)			

Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. The measure of consumption (the dependent variable) is the sum of the value of grain, food, nondurables all in units of 1975 Rupees per adult equivalent per month. The results reported in the table are all based on data corrected for manipulation errors. Only income coefficients that are significantly positive are regarded as rejection of full risk sharing. Townsend: pooled panel, dependent variable is deviation from village/caste average; Deaton: using time dummies for each village or caste; Suri: coefficient on village/caste nonlabor income is the between estimate and the non-linear test for full risk sharing is whether the contrast estimator $\hat{\beta} = 1$ and the test of zero risk sharing is $\hat{\beta} = 0$. The Bonferroni corrected p-value at the 10% level is 0.033 for 3 villages; 0.0077 for 13 castes and 0.0125 for the 8 castes with heterogeneous preferences. Coefficients that are significant at the 10% level after Bonferroni correction for the 3 villages and 13 castes appear in bold and those for 8 castes with heterogeneous preferences appear in italic.

Table A3—: Replication of standard test of efficient risk sharing using Grain and food only and different testing methods

	MS		Townsend	Deaton	Suri				N
	Coefficient on village/caste expenditure	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on nonlabor income	Coefficient on village/caste nonlabor income	Contrast Estimator	Test of full risk sharing [p-value]	Test of zero risk sharing [p-value]	
AUREPALLE									
All households	0.999***	**0.006****	**0.006****	**0.006****	0.002	-2.350	0.207	0.376	3689
	(0.068)	**(0.002)**	**(0.002)**	**(0.003)**	(0.001)	(2.655)			
By caste									
Rank = 7.5	1.015***	-0.027***	-0.027***	-0.036***	0.048***	1.752***	0.049	0.000	595
	(0.051)	(0.008)	(0.008)	(0.011)	(0.014)	(0.382)			
Rank = 18.75	1.001***	-0.001	-0.001	-0.002	0.014	1.140	0.897	0.290	238
	(0.057)	(0.007)	(0.007)	(0.017)	(0.011)	(1.077)			
Rank = 30	1.010***	-0.007*	-0.007*	-0.011**	0.023***	1.470***	0.252	0.000	595
	(0.052)	(0.004)	(0.004)	(0.005)	(0.005)	(0.410)			
Rank = 55	1.001***	0.002	0.002	0.003	-0.008*	1.390*	0.596	0.059	952
	(0.048)	(0.003)	(0.003)	(0.004)	(0.004)	(0.737)			
Rank = 86.25	0.976***	0.004*	0.004*	0.008**	0.009***	0.143	0.033	0.721	595
	(0.070)	(0.002)	(0.002)	(0.003)	(0.002)	(0.402)			
Rank = 97.5	0.999***	-0.003	-0.003	-0.012	0.004	4.049	0.599	0.485	238
	(0.057)	(0.004)	(0.004)	(0.010)	(0.005)	(5.793)			
SHIRAPUR									
All households	0.996***	0.000	0.000	0.000	0.009***	0.970***	0.743	0.000	3316
	(0.051)	(0.001)	(0.001)	(0.001)	(0.001)	(0.091)			
By caste									
Rank = 5	0.986***	0.023*	0.023*	0.036**	0.041**	0.139	0.061	0.762	428
	(0.056)	(0.012)	(0.012)	(0.017)	(0.016)	(0.459)			
Rank = 23.75	0.986***	0.002**	0.002**	0.003**	0.007***	0.540*	0.111	0.061	856
	(0.059)	(0.001)	(0.001)	(0.001)	(0.001)	(0.288)			
Rank = 72.5	0.992***	-0.000	-0.000	-0.001	0.005***	1.109***	0.465	0.000	1604
	(0.060)	(0.001)	(0.001)	(0.001)	(0.001)	(0.149)			
KANZARA									
All households	0.991***	0.002**	0.002**	0.003**	0.017***	0.843***	0.114	0.000	3740
	(0.036)	(0.001)	(0.001)	(0.001)	(0.001)	(0.100)			
By caste									
Rank = 11.25	1.004***	-0.005*	-0.005*	-0.006*	0.003	3.103	0.432	0.247	637
	(0.064)	(0.003)	(0.003)	(0.003)	(0.004)	(2.677)			
Rank = 55	0.992***	0.001	0.001	0.001	-0.004	1.141	0.900	0.310	1391
	(0.041)	(0.003)	(0.003)	(0.003)	(0.004)	(1.125)			
Rank = 76.25	0.992***	0.001	0.001	0.001	0.013***	0.890***	0.629	0.000	321
	(0.072)	(0.003)	(0.003)	(0.004)	(0.003)	(0.228)			
Rank = 91.25	0.987***	0.002	0.002	0.003	0.022***	0.867***	0.265	0.000	749
	(0.073)	(0.002)	(0.002)	(0.003)	(0.002)	(0.119)			

Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. The measure of consumption (the dependent variable) is the sum of the value of grain and food only all in units of 1975 Rupees per adult equivalent per month. The results reported in the table are all based on data corrected for manipulation errors. Only income coefficients that are significantly positive are regarded as rejection of full risk sharing. Townsend: pooled panel, dependent variable is deviation from village/caste average; Deaton: using time dummies for each village or caste; Suri: coefficient on village/caste nonlabor income is the between estimate and the non-linear test for full risk sharing is whether the contrast estimator $\hat{\beta} = 1$ and the test of zero risk sharing is $\hat{\beta} = 0$. The Bonferroni corrected p-value at the 10% level is 0.033 for 3 villages; 0.0077 for 13 castes and 0.0125 for the 8 castes with heterogeneous preferences. Coefficients that are significant at the 10% level after Bonferroni correction for the 3 villages and 13 castes appear in bold and those for 8 castes with heterogeneous preferences appear in italic.

Table A4—: Caste Group Description

	Caste Name	Occupation	Are Risk Preferences Heterogeneous?
AUREPALLE			
Rank = 7.5	Madiga	Labor	Yes
Rank = 18.75	Mala	Labor	Yes
Rank = 30	Kurba	Sheppard	No
Rank = 55	Gowda	Toddy Tapping	Yes
Rank = 86.25	Reddi	Farmers	No
Rank = 97.5	Brahmin	Land Owners	No
SHIRAPUR			
Rank = 5	Mahar	Labor	No
Rank = 23.75	Dhangar	Sheppards	Yes
Rank = 72.5	Maratha	Farmers	Yes
KANZARA			
Rank = 11.25	Mahar	Labor	No
Rank = 55	Mali	Farmer/Labor	Yes
Rank = 76.25	Gosavi	Farmer/Labor	Yes
Rank = 91.25	Maratha	Land Owners	Yes

Caste names and occupations associated with each caste rank are collected from Doherty (1992). Heterogeneity in risk preferences is reproduced from the "Test of homogeneity in risk preferences" presented in Table 2 in (Mazzocco and Saini, 2012, p. 455)