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A Comment on "Climate Change and Labor Reallocation: Evidence from Six Decades of the Indian Census" by Liu, Shamdasani, and Taraz (2023)

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No. 162

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September 2024

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Abstract

Liu, Shamdasani, and Taraz (2023) examine, among other things, the effect of temperature and precipitation in India during the growing season (June-February) on the agricultural and non-agricultural worker share in Indian districts in the medium run (decades) and in the long run (30 years). In their preferred analytical specification, they find that a 1°C increase in temperature leads to a 17% increase in the agricultural labor share (corresponding to a logarithmic coefficient of 0.157) and an 8.2% decrease in the nonagricultural labor share (corresponding to a logarithmic coefficient of -0.086) in the medium term. The effects are significant at the 5% and 1% level (5% and 5% with Conley standard errors), respectively. For precipitation, they do not find effects significantly different from 0. First, we rerun the code with neither execution nor coding errors. Second, we reproduced the main tables in a different software language and did find the same results. Lastly, we tested the robustness by weighting the districts with the population size. Here, we find that the effects in the medium run become significantly smaller and not statistically significant anymore. However, the effects in the long run stay roughly the same. By splitting the sample in low and highly populated districts we find that the medium run effects are only present in low populated districts with no effect on highly populated ones.

1. Introduction

Liu, Shamdasani, and Taraz (2023), henceforth LST, investigate the effects changes in temperature and precipitation during the growing season (June-February) on agricultural and nonagricultural labor shares as well as urbanization and migration. LST use data on a district level for all districts in India from 1951 to 2011. They also explore discuss possible mechanisms for their findings.

This replication prepared for the Institute for Replication (Brodeur et al., 2024) focuses on the effects of temperature change on agricultural worker share and non-agricultural worker share as defined by LST¹ as these are the main results highlighted on their abstract *“We find that rising temperatures are associated with lower shares of workers in nonagricultural sectors, with effects intensifying over a longer time frame.”* (LST, 2023: 395). The specific results, as described by the authors are twofold: *“First, we find that rising temperatures inhibit structural transformation in Indian districts. The magnitude of this effect—estimated using a decadal panel specification—is economically meaningful: a 1°C increase in mean decadal temperature in an average Indian district leads to a 17.0 percent increase in the share of the labor force who are agricultural laborers and an 8.2 percent decline in the share of the labor force engaged in nonagriculture. [...] Second, we find that the adverse effects of rising temperatures on structural transformation are amplified when we examine impacts over a longer time frame.”* (LST, 2023: 397). Although the underlying mechanisms are also an important contribution of LST (2023), we do not explore these results as they do not only depend on econometric findings but also strongly on theory. Examining these theoretical contributions or the related literature in depth is beyond the scope of this comment.

In terms of reproducibility, we reproduced all tables in the paper using the original reproduction package and the provided Stata code without noting any execution errors. Although some raw data sets are now unavailable from their original sources, we could use their copy in the replication package. We also replicated

¹ Please note that agricultural worker share and non-agricultural worker share do not necessary add up to one since also cultivators exist in India who work on own land without being employed.

LST's main tables 2 and 3 (Table III – Replication Table 2: Own Replication by R; Temperature on nonag. worker share and Table IV – Replication Table 3: Own Replication by R; Temperature on nonag. worker share using long difference specification in this replication²) by writing our own code in R and taking the already cleaned data as given. Here, we get the same coefficients as LST and very similar standard errors.

Lastly, we turn to the sensitivity analysis. As mentioned above, we test the robustness of the results to weighting districts by population size. Here, we find for most regressions similar results like in the tables 2 and 3 of the original paper by LST. However, for the main specification of the effect of temperature on nonagricultural worker share in the medium run the results turn insignificant. By exploring the results on two sub-samples of low- and highly populated districts (separated by the median), we can show that the coefficient is higher and significant for low-populated districts but very close to zero and statistically insignificant for high-populated districts. This indicates that the effect of temperature on non-agricultural worker share is heterogenous for areas with different total population.

The following is organized as follows: in section 2 we detail our replication of their main results are with their code using Stata and with our code in R. In section 3, we test the robustness of such results by weighting districts by their respective population to get estimates that are representative of the average effect per person. Finally, section 4 concludes.

2. Reproducibility

First, we tried to download the original data directly from the sources, but some was no longer available. First, it was not possible to download the PCA data from the dropbox link on the website mentioned in the 'Readme' file³. Secondly, the

² Please note that through the whole replication report Roman numerals refer to tables in the replication and Arabic numerals refer to tables in the original paper

³ <https://sites.google.com/site/mishrasumitr/data>

census data from censusindia.gov.in was not available⁴. We then proceeded to use the copy of the original (raw) files in the replication package. The whole replication package can be executed by following the instructions of the readme file with no errors. The results we got are exactly the same as in the paper. We also acknowledge that the code was also successfully reproduced by the data editor's team at the *American Economic Review*.

For the reader, we provide the original and our replicated results of the effect of temperature on nonagricultural worker share with region-year fixed effects in Table I – Replication Table 2: Just running code; Temperature on nonag. worker share and Table II – Replication Table 3: Just running the code; Temperature on nonag. worker share using long difference specification. This corresponds to column 4 of table 2, respectively column 2 of table 3 of the original paper.

After reading and running the original Stata code, we reproduced the main results from tables 2 and 3 from the paper in R, using the package `fixest` (Bergé, 2018). We did not replicate the data set but only started with the prepared data set and conducted the regressions with it. The estimates and clustered standard errors are virtually identical. We find slightly different Conley standard errors. However, this does not affect the respective significance levels. As an example, you can find a comparison of the main effect of the temperature on nonagricultural worker share using region-year fixed effects in Table III – Replication Table 2: Own Replication by R; Temperature on nonag. worker share for the medium run (table 2 in original paper) and in Table IV – Replication Table 3: Own Replication by R; Temperature on nonag. worker share using long difference specification for the long run (table 3 in original paper). The complete tables can be found in the appendix.

3. Robustness and interpretation

It is plausible that changes in temperature and precipitation have heterogeneous effects across Indian districts due to district-specific susceptibility and adaptive

4 With links <https://censusindia.gov.in/DigitalLibrary/TablesSeries2001.asp> , <https://censusindia.gov.in/2011census/maps/maps2011.html> , and https://www.censusindia.gov.in/2011census/population_enumeration.html .

capacity. Pham (2023) look at the case of Vietnam and show how openness to trade is an important factor on the effect of temperature shocks on changes of agricultural and non-agricultural worker shares. Pham (2023) finds that “connected” areas can have opposite effects of temperature shocks than “isolated” areas effects.

This goes in line with table B6 of the online appendix of LST, which looks at urban and rural areas within districts, finding results only in “rural” areas and the discussion in LST “mechanisms” section and their analysis of “road connectivity”. Given districts’ population varies considerably (see Figure 1) and the above characteristics would probably vary between high- and low-population districts, we decided to weight the regressions by district population to get a set of results that are representative for the average person instead of the average district. This would avoid that many small and less economically relevant low population districts “count” as much as large high-population districts.

The results from a population-weighted regression show that the estimates of the effect of temperature on agricultural and nonagricultural worker share become insignificant. Our Table Va – Replication Table 2: Weighting districts by population; Temperature on nonag. worker share shows that the coefficient size for the medium run (in LTS table 2, column 4) shrinks from -0.09 to -0.02 and becomes insignificant. The same is true for the effect of temperature on agricultural work force in Table Vc – Replication Table 2: Weighting districts by population; Temperature on ag. worker share using region-year trends (from 0.18 to 0.09). We did not manage to reproduce the Conley standard errors due to missing specifications in the used Stata package (Fetzer, 2023). However, we suspect that the effect would not be significant using those standard errors since they tend to be even larger.

Interested by these results we explore these effects on two sub-samples of low- and highly populated districts (separated by the median population in 1971⁵) and keeping the population weights. The results are reported in Table VI – Replication Table 2: Split by population. The negative effect is only significant for low populated districts (23.8% of the population) while in high populated districts (76.2%) the

⁵ Using 1961 population does not change the results.

coefficient becomes positive, albeit insignificant. This is a strong indication for heterogeneous effects by district population size which explains the difference in the two specifications – unweighted districts and population weighted districts.

The effect size of temperature on nonagricultural labor in the long run (in the original paper table 3, column 2) stays negative and significant, although smaller. It changes only minor from -0.15 in the original paper to -0.13 in our population weighted estimate. It also changes its significance level slightly from the 1% to the 5% level as can be seen in Table VIIa – Replication Table 3: Weighting districts by population; Temperature on nonagricultural worker. This is also the case for the coefficients in the long run for the effect of temperature on worker share in Table VIIb – Replication Table 3: Weighting districts by population; Temperature on agricultural worker where the effect size gets reduced from 0.38 being significant at the 1% level in LST to 0.24 being significant at the 10% level in our populated-weighted replication.

4. Conclusion

We find that the code is very well documented and structured, with just some minor issues regarding the availability of a few raw data sets. We are also able to reproduce the original results recoding the original code in R instead of Stata. However, conducting a robustness test by weighting the results by population size, suggests that the results in the original paper are driven by districts with low population. These results are in line with new evidence from Vietnam and the theoretical model put forward by Liu et al. (2023).

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Fetzer, Timo. "Conley Spatial Hac Errors with Fixed Effects". <http://www.trfetzer.com/conley-spatial-hac-errors-with-fixed-effects/> [Accessed 03.09.2023] (2023)

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Figures

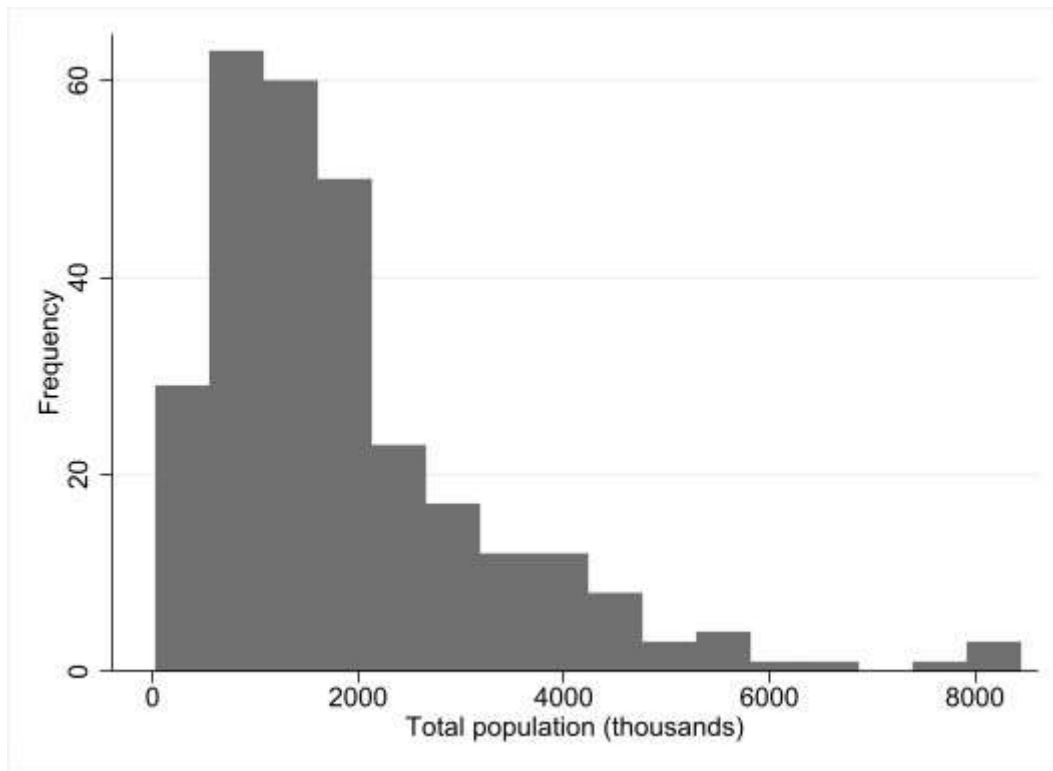


Figure 1: Distribution of population for Indian districts in 1971. From the smallest to the largest districts there is a factor of a hundred.

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Table I – Replication Table 2: Just running code; Temperature on nonag. worker share

OLS	Natural logarithm nonagricultural worker share Original study (1)	Natural logarithm nonagricultural worker share (2)
Temperature	- 0.086	-0.086
	(0.031)***	(0.031)***
	[0.035]**	[0.035]**
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
R ²	/	
Observations	1,620	1,620

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table II – Replication Table 3: Just running the code; Temperature on nonag. worker share using long difference specification

OLS	Natural logarithm Long Difference in nonagricultural worker share unweighted Original study (1)	Natural logarithm Long Difference in nonagricultural worker share unweighted (2)
Temperature	- 0.1491 (0.0531)*** [0.0621]**	- 0.1491 (0.0531)*** [0.0621]**
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	270	270
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table III – Replication Table 2: Own Replication by R; Temperature on nonag. worker share

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share unweighted (2)
Temperature	- 0.086 (0.031)*** [0.035]**	-0.0859 (0.0311)*** [0.0297]***
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,620	1,620
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table IV – Replication Table 3: Own Replication by R; Temperature on nonag. worker share using long difference specification

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share unweighted (2)
Temperature	-0.1491 (0.0531)*** [0.0621]**	-0.1491 (0.0542)*** [0.0635]**
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	270	270
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us.

Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Va – Replication Table 2: Weighting districts by population; Temperature on nonag. worker share

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share weighted by population (2)
Temperature	- 0.086	-0.021
	(0.031)***	(0.030)
	[0.035]**	[0.038]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
R ²	/	
Observations	1,620	1,620

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us.

Significant at the ***[1%] **[5%] *[10%] level

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vb – Replication Table 2: Weighting districts by population; Temperature on nonag. worker share using region-year trends

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share weighted by population (2)
Temperature	-0.077	0.003
	(0.033)**	(0.035)
	[0.038]**	[0.037]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,620	1,620
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vc – Replication Table 2: Weighting districts by population; Temperature on ag. worker share using region-year trends

OLS	Natural logarithm agricultural worker share unweighted Original study (1)	Natural logarithm agricultural worker share weighted by population (2)
Temperature	0.181 (0.059)*** [0.077]**	0.086 (0.061)* [0.079]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,548	1,548
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vd – Replication Table 2: Weighting districts by population; Temperature on ag. worker share

OLS	Natural logarithm agricultural worker share unweighted Original study (1)	Natural logarithm agricultural worker share weighted by population (2)
Temperature	0.157	0.068
	(0.062)**	(0.064)
	[0.076]**	[0.081]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,548	1,548
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Ve – Replication Table 2: Weighting districts by population; Temperature on urbanization

OLS	Natural logarithm Urbanization unweighted Original study (1)	Natural logarithm Urbanization weighted by population (2)
Temperature	0.001 (0.045) [0.046]	-0.006 (0.039) [0.044]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,596	1, 596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vf – Replication Table 2: Weighting districts by population; Temperature on urbanization using region-year trends

OLS	Natural logarithm Urbanization unweighted Original study (1)	Natural logarithm Urbanization weighted by population (2)
Temperature	-0.021 (0.042) [0.046]	-0.028 (0.037) [0.045]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,596	1, 596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vg – Replication Table 2: Weighting districts by population; Temperature on migration using region-year trends

OLS	Natural logarithm Migrant Share unweighted Original study (1)	Natural logarithm Migrant Share weighted by population (2)
Temperature	-0.013 (0.059) [0.062]	0.038 (0.053) [0.063]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,596	1, 596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vh – Replication Table 2: Weighting districts by population; Temperature on migration

OLS	Natural logarithm Migrant Share unweighted Original study (1)	Natural logarithm Migrant Share weighted by population (2)
Temperature	-0.018 (0.064) [0.068]	0.054 (0.058) [0.073]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,596	1, 596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vi – Replication Table 2: Weighting districts by population; Precipitation on ag. worker share using region-year trends

OLS	Natural logarithm agricultural worker share unweighted Original study (1)	Natural logarithm agricultural worker share weighted by population (2)
Precipitation	- 0.153 (0.059)*** [0.098]	-0.132 (0.098)* [0.117]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,548	1,548
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vj – Replication Table 2: Weighting districts by population; Precipitation on ag. worker share

OLS	Natural logarithm agricultural worker share unweighted Original study (1)	Natural logarithm agricultural worker share weighted by population (2)
Precipitation	- 0.081 (0.060) [0.093]	-0.139 (0.088)* [0.110]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,548	1,548
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vk – Replication Table 2: Weighting districts by population; Precipitation on nonag. worker share using region-year trends

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share weighted by population (2)
Precipitation	– 0.026	-0.030
	(0.030)	(0.030)
	[0.036]	[0.040]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,620	1,620
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table VI – Replication Table 2: Weighting districts by population; Precipitation on nonag. worker share

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share weighted by population (2)
Precipitation	-0.001	0.045
	(0.030)	(0.033)*
	[0.032]	[0.035]*
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,620	1,620
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us.

Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vm – Replication Table 2: Weighting districts by population; Precipitation on Urbanization using region-year trends

OLS	Natural logarithm Urbanization unweighted Original study (1)	Natural logarithm Urbanization weighted by population (2)
Precipitation	0.025 (0.042) [0.044]	0.054 (0.035)* [0.047]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,596	1,596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us.

Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vn – Replication Table 2: Weighting districts by population; Precipitation on Urbanization

OLS	Natural logarithm Urbanization unweighted Original study (1)	Natural logarithm Urbanization weighted by population (2)
Precipitation	0.000	0.045
	(0.044)	(0.034)*
	[0.045]	[0.048]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,596	1,596
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vo– Replication Table 2: Weighting districts by population; Precipitation on Migrant Share using region-year trends

OLS	Natural logarithm Migrant Share unweighted Original study (1)	Natural logarithm Migrant Share weighted by population (2)
Precipitation	-0.016 (0.050) [0.058]	-0.051 (0.053) [0.060]
Control Variables		
Region-year trends	Yes	Yes
Region-year FEs	No	No
Observations	1,350	1,350
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table Vp – Replication Table 2: Weighting districts by population; Precipitation on Migrant Share

OLS	Natural logarithm Migrant Share unweighted Original study (1)	Natural logarithm Migrant Share weighted by population (2)
Precipitation	-0.000	0.036
	(0.058)	(0.065)
	[0.064]	[0.070]
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	1,350	1,350
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table VI – Replication Table 2: Split by population

OLS	Natural logarithm nonagricultural worker share unweighted Original study (1)	Natural logarithm nonagricultural worker share High population (2)	Natural logarithm nonagricultural worker share Low population (3)
Temperature	- 0.086 (0.031)*** [0.035]**	0.042 (0.043) [0.049]	-0.144 (0.047) *** [0.049] ***
Control Variables			
Region-year trends	No	No	No
Region-year FEs	Yes	Yes	Yes
Observations	1,620	810	810
R ²	/	0.047	0.050

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table VIIa – Replication Table 3: Weighting districts by population; Temperature on nonagricultural worker

OLS	Natural logarithm Long Difference in nonagricultural worker share unweighted Original study (1)	Natural logarithm Long Difference in nonagricultural worker share Weighted by population (2)
Temperature	- 0.1491 (0.0531)*** [0.0621]**	-0.1272 (0.0528)** [0.0621]**
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	270	270
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Table VIIb – Replication Table 3: Weighting districts by population; Temperature on agricultural worker

OLS	Natural logarithm Long Difference in agricultural worker share unweighted Original study (1)	Natural logarithm Long Difference in agricultural worker share weighted by population (2)
Temperature	0.3819 (0.0995)*** [0.2292]*	0.2355 (0.1291)* [0.2292]*
Control Variables		
Region-year trends	No	No
Region-year FEs	Yes	Yes
Observations	258	258
R ²	/	/

Note: Asterisks and R² not reported in the original paper; Asterisks calculated and added by us. Significant at the ***[1%] **[5%] *[10%] level.

Like in the original paper we present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

Appendix

Appendix I – Tables from the original paper

TABLE 2—EFFECT OF RISING TEMPERATURES USING PANEL SPECIFICATION

	Ag. labor share		Nonag. worker share		Urbanization		Migrant share	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
T	0.181 (0.059) [0.077]	0.157 (0.062) [0.076]	-0.077 (0.033) [0.038]	-0.086 (0.031) [0.035]	-0.021 (0.042) [0.046]	0.001 (0.045) [0.046]	-0.013 (0.059) [0.062]	-0.018 (0.064) [0.068]
P	-0.153 (0.059) [0.098]	-0.081 (0.060) [0.093]	-0.026 (0.030) [0.036]	-0.001 (0.030) [0.032]	0.025 (0.042) [0.044]	0.000 (0.044) [0.045]	-0.016 (0.050) [0.058]	-0.000 (0.058) [0.064]
Region-year trends	Y	N	Y	N	Y	N	Y	N
Region-year fixed effects	N	Y	N	Y	N	Y	N	Y
Observations	1,548	1,548	1,620	1,620	1,596	1,596	1,350	1,350

Notes: The dependent variable is the natural logarithm of the share of agricultural laborers in columns 1 and 2, of the share of nonagricultural workers in columns 3 and 4, of urbanization rates in columns 5 and 6, and of the share of intradistrict migrants in columns 7 and 8. Temperature and precipitation are decadal averages of the past ten growing seasons. Data are district-level panel data constructed from the Indian census. We restrict our sample to districts for which the dependent variable is nonmissing in all years. All columns include district and year fixed effects. We present standard errors clustered by district in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.

TABLE 3—EFFECT OF RISING TEMPERATURES USING LONG DIFFERENCE SPECIFICATION

	Ag. labor share	Nonag. worker share	Urbanization	Migrant share
	(1)	(2)	(3)	(4)
T	0.3819 (0.0995) [0.2292]	-0.1491 (0.0531) [0.0621]	-0.0434 (0.0827) [0.1569]	-0.1716 (0.1619) [0.2092]
P	0.3256 (0.2236) [0.4429]	0.0202 (0.1080) [0.0777]	-0.2617 (0.1830) [0.1494]	0.0350 (0.4016) [0.5837]
Region fixed effects	Y	Y	Y	Y
Observations	258	270	266	267

Notes: The dependent variable in each column is the difference (in natural logarithm) of an outcome between two 30-year periods, 1961–1981 and 1991–2011. The outcomes are the share of agricultural laborers in column 1, the share of nonagricultural workers in column 2, urbanization rates in column 3, and the share of intradistrict migrants in column 4. The independent variables are differences in average growing-season temperature and precipitation over the same time periods. Data are district-level data constructed from the Indian census. All columns include region fixed effects. We present standard errors in parentheses and Conley standard errors that allow for spatial correlation up to 500 kilometers and arbitrary serial correlation in brackets.