Anticipatory Migration and Local Labor Responses to Rural Climate Shocks

Esteban J. Quiñones♦♣

University of Wisconsin–Madison

Department of Agricultural and Applied Economics

Center for Demography and Ecology

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♦ Email: equinones@wisc.edu. Website: www.ejquinones.com.

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Abstract

Climate change has increased the incidence and severity of temperature and precipitation shocks affecting agricultural production. Observed levels of adaptation remain low, suggesting that rural households are constrained or adaptation decisions are suboptimal. I integrate panel socioeconomic and demographic data from rural Mexico with high temporal and spatial resolution weather data to assess if individuals adapt to the heat-induced crop losses of neighboring households via anticipatory (*ex ante*) labor responses. I instrument for the proportion of catastrophic crop loss reports in a community with exogenous variation in extreme daily temperatures to obtain estimates of ex ante migration and local labor reallocation for households that have not experienced recent crop shocks but observe the heat-induced crop losses of others. I find evidence of domestic migration in anticipation of crop shocks, particularly among females and households with lower land-labor ratios. The majority of migrants temporarily relocate to a city, other state or country, which is consistent with spatial risk diversification to climate risk. I also show evidence of local labor reallocation onto household land (agricultural self-employment), especially among males and households with higher land-labor ratios. This study highlights the substantial influence of the environment-agriculture mechanism, the salience of anticipatory adaptation, and the relevance of *learning from others* in the context of climate risk. These findings have important implications for the design and targeting of rural climate change mitigation programs, suggesting that *adaptation gaps* are likely overstated and that rural households have different capacities to mitigate the risks associated with climate shocks.

Keywords: ex ante, migration, climate change, shocks, spillovers, and learning from others

JEL Codes: J61, O15, Q54

1. Introduction

Agricultural households in low- and middle-income countries are exposed to harmful shocks including conflict, loss of employment, crop failures, and natural disasters. Households mitigate the adverse impacts of these shocks by drawing down savings, smoothing and reducing consumption, relying on informal insurance networks, and diversifying their income-generating portfolio (Rosenzweig and Wolpin, 1993; Udry, 1994, 1995). How households respond after destabilizing shocks is well documented, but how household preemptively respond to the threat of shocks is not. This study examines how households behave in *anticipation* of future climate-induced crop shocks.

Over the next few decades, climate change is expected to increase the frequency, intensity, and duration of climate events (Lesk, Rowhani, and Ramankutty, 2016), including extreme precipitation and temperatures and natural disasters.[1] Most of what we know about the impact of these events—that they increase morbidity and mortality, depress agricultural outcomes and labor productivity, as well as intensify conflict (Schlenker, Hanemann, and Fisher, 2005)—is learned by studying behavioral responses after direct household exposure.[2] Because climate shocks are not transitory and more difficult to insure against locally, it is essential to understand how households respond to the *threat* of future shocks. To date, this type of anticipatory behavior is largely undocumented. In fact, the lack of empirical evidence on adaptation to climate shocks has given rise to the term *adaptation gaps*—the appearance of suboptimal adaptation to climate change—raising questions about why these gaps exist (Carleton and Hsiang, 2016).

I examine whether households engage in ex ante (anticipatory) migration or local labor reallocation to mitigate against future heat–induced crop shocks in rural, agricultural communities located in Mexico. I pay special attention to how asset endowments and gender shape these responses.

Poor households in marginalized communities, especially those that rely on smallholder agricultural production for their livelihoods, may be particularly vulnerable to climate change (IPCC, 2014). This is not only because their incomes are dependent on agriculture, but also because adaptation options are especially limited for asset-poor households. As a result, poor households

[1] Also see Meehl et al. (2000), Easterling et al., (2000) Strömberg, (2007), Pachauri and Reisinger (2007), Rahmstorf and Coumou (2011), Coumou and Rahmstorf (2012), and Cai et al. (2014).
[2] Also see Barreca (2010), Hsiang, Burke, and Miguel (2013), and Burke, Hsiang, and Miguel (2015).

are likely to adjust to climate change through labor reallocation. Adaptation through labor can take at least two forms: (i) international or domestic migration and (ii) local labor reallocation in, out, or across employment opportunities. Recent studies demonstrate that migration is a relevant adaptation strategy to climate change (Gray and Mueller, 2012; Jessoe, Manning, and Taylor, 2018).[3] Local labor adjustment has also been confirmed to be a salient response to climate change (Hsiang, 2010; Jessoe, Manning, and Taylor, 2018).[4]

The aforementioned line of research largely documents ex post effects and subsequent human responses after direct exposure to a climate shock. The focus on ex post dynamics is necessary; direct effects and reactions to climate events are likely to be of immediate importance to household well-being in the aftermath of a shock. While there has been longstanding interest in understanding ex ante adaptation, identifying ex ante impacts and responses has proven challenging (Rosenzweig, 1988a, 1988b; Rosenzweig and Stark, 1989; Murdoch, 1990; Rosenzweig and Binswanger, 1993; Rose, 2001; Dillon, Mueller, and Salau, 2011). Anticipatory behavior may be a particularly important adaptation strategy in situations characterized by high uncertainty and episodic climate shocks (Sander, Abel, and Riosmena, 2014). In this study, I leverage clustered household data against high-resolution weather data, making it possible to observe household responses to the observation that *neighbors* suffer weather-induced crop losses.

Mexico is well suited for this study for several reasons. First, smallholder farmers are prevalent; 77 percent of rural property is owned by farmers with less than 5 hectares of land (Juarez, 2013). Second, these smallholders are situated in a diverse landscape in terms of agroecological conditions (Améndola, Castillo, and Martínez, 2006). Agricultural outcomes, associated labor allocations, and sensitivity to climate shocks vary considerably across Mexico. Third, diversified income portfolios are common in rural areas and heterogeneous across the country (Hanson and McIntosh, 2010). Many of these portfolios feature migration; Mexico is the source of approximately 13 million international migrants, primarily to the United States (World Bank, 2016). The number of internal migrants is thought to be roughly twice as large (Cuecuecha and Pederzini, 2012). Not surprisingly, agricultural production is strongly correlated with household investment decisions including migration (Feng, Krueger, and Oppenheimer 2010). In

[3] Also see Feng, Krueger, and Oppenheimer (2010), Gray and Bilsborrow (2013), and Cattaneo and Peri (2015).
[4] Also see Graff Zivin, Hsiang, and Neidell (2015) and Burke, Hsiang, and Miguel (2015).

fact, a number of other studies in Mexico have demonstrated the salience of an ex post relationship between climate events and local labor or migration allocations (Jessoe, Manning, and Taylor, 2018; Riosmena, Nawrotzki, and Hunter, 2018).[5] These features provide a suitable setting for studying whether climate-induced crop losses are associated with ex ante labor reallocation.

I integrate panel socioeconomic data from the Mexican Family Life Survey (MxFLS) with georeferenced, high temporal resolution weather data from the Agricultural Modern-Era Retrospective Analysis for Research and Applications Climate Forcing Dataset for Agricultural Modeling (AgMERRA), along with supplementary information from the Mexican Population and Agricultural Censuses. I develop an approach that credibly disentangles ex ante from ex post responses to temperature-induced catastrophic crop losses. I define ex ante responses as those in anticipation of a future climate-induced crop loss, in contrast to ex post responses after direct exposure to a crop shock.[6] Individuals face uncertainty about the expected income effects of intensifying climate risks. This uncertainty shapes the choices agents make to insure against climate shocks, but can be reduced by learning about the adverse effects of the evolving climate through agricultural outcomes on their own plots and from other households in their communities.

This research design focuses on the labor reallocations of individuals in households that did not experience a crop shock but observed the climate-induced crop losses of other households in their community. The extent of neighboring climate-induced crop shocks is arguably indicative of the probability of experiencing a similar adverse shock in the future. In so doing, the research tests for further evidence of *learning from others* (Foster and Rosenzweig, 1995).[7] In these tests, I consider that the responses of men and women may be distinct, given marked gender differences

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[5] Also see Munshi (2003), Nawrotzki and DeWaard (2016), and Jessoe, Manning, and Taylor (2018).
[6] It can be argued that anticipatory responses are not purely ex ante in this context because they do not predate experiencing extreme heat, which everyone in a community experiences to some degree. I argue, however, that what is more important for inducing responses and adaptation are not the climate events themselves, but rather adverse crop outcomes such as climate-induced crop losses. Forming accurate expectations of how extreme heat events impact crop outcomes and income is not straightforward. This requires precisely evaluating whether heat realizations cross influential agronomic or behavioral expectation thresholds over consecutive days and then estimating the extent to which crops and livelihoods will be adversely affected. In contrast, heat-induced crop losses are observable, reflecting the risk associated with climate events that potentially undermines livelihoods rural communities. Hence, the most pertinent definition of ex ante is with respect to the increased likelihood of future climate-induced crop shocks.
[7] See Besley and Case (1994), Munshi (2004), Bandiera and Rasul (2006), and Conley and Udry (2010).

in labor allocation, migration, and contributions to household production in Mexico (Amuedo-Dorantes and Pozo, 2006).[8]

I instrument for the extent of community-level crop shocks—the proportion of households that experience crop losses—using a measure of extreme heat deviations (relative to the long-term mean) observed with high temporal and spatial resolution. Instrumenting for community-level crop losses with plausibly exogenous temperature anomalies serves to pin down explicitly the climate-agriculture-labor mechanism while minimizing selection in community-level vulnerability to climate shocks. The assumptions involved in this empirical strategy and the extent to which they are plausible are introduced further below and detailed in the empirical strategy (Section 6). In other words, I test an agricultural learning from others channel with an instrumental variables (IV) approach where extreme heat realizations instrument for the proportion of crop shocks at the community level. Documenting the mechanisms through which certain behaviors emerge is crucial to our understand of what happens and why (Heckman, Pinto, and, Savelyev 2012).The robustness of the findings generated by this strategy are tested and broadly confirmed with respect to alternative mechanisms, ex post responses, alternative fixed effect specifications, confounding shocks, attrition, and the strength of this learning from others signal.

I find evidence of ex ante domestic migration, particularly among females and households with more labor. In the 2002–2003 period directly after the heat-induced crop losses of other households are observed, I estimate an average increase in domestic migration of 2.6 percentage points from 2002 to 2003 and a 3.6 percentage point increase specifically for women. I also estimate an average increase in domestic migration from 2002 to 2005 of 3 to percentage points. These are proportionally large responses, representing increases of 52 to 120 percent. These findings are indicative of an ex ante adaptation strategy to climate change aimed at mitigating the amplified risk of a future crop shock. This is corroborated by the descriptive finding that the majority of migrants (upwards of 62 percent) temporarily relocate to a city, other state within Mexico or internationally, which is consistent with a risk diversification motive.

I also find evidence of an increase in agricultural self-employment coupled with a decrease in agricultural wage work, especially among males. I estimate an average increase in agricultural self-employment of 8.5 percentage points increase in 2002, which is driven by a 15.6 percentage point increase among men (more than half of which is sustained through 2005). These results also

[8] Also see Cox-Edwards and Rodríguez-Oreggia (2009), and Feliciano (2008), and Garip (2012).

constitute proportionally large responses, ranging from a 49 to 53 percent increase in agricultural self-employment. In contrast to migration, it is unlikely that these local labor results strictly constitute ex ante adaptation. They are, more likely than not, explained by access to land that serves as a safety valve in response to changes in the demand for and value of local agricultural labor.

One potential alternative explanation is that migration and local labor reallocations are driven by changes in the demand for and value of local labor. This, however, is unlikely as substantial shifts in total or specific types of employment are not observed from 2002 to 2005. While general equilibrium labor shifts appear unlikely, local labor reallocations may be more sensitive to the moderate changes in the local labor market than migration. It is also possible that other mechanisms, such moderate crop losses within the household, drops in productivity, or increased violence and crime, and price shocks shape the temperature-labor allocation relationship. I empirically test the salience of any plausible alternative mechanism with a method developed by Acharya, Blackwell and Sen (2016) and do not find evidence of a residual relationship between extreme heat and migration or local labor decisions, net of the catastrophic crop losses mechanism.

The lack of evidence of alternative explanations lends credence to the assumption that catastrophic crop loss is the mechanism through which extreme temperature deviations influence migration decisions (exclusion restriction). In addition, this empirical strategy rests on the assumption that heat deviations are distributed as if they are random across municipalities (independence assumption). This form of exogeneity is plausible, conditional on municipality and state controls. The remaining selection in my analytical sample of households that do not experience heat-induced crop shocks with respect to vulnerability to climate shocks suggests that estimates of migration or local labor reallocation are likely to be conservative.[9] These assumptions are discussed in further detail in Section 6 and a number of caveats are considered in Section 7.

[9] The assumption that households that did not experience crop losses in low-shock communities are similar to households that did not experience crop losses in high-shock communities is an additional assumption. I show, however, that unaffected households in low shock communities are in fact less vulnerable (more resilient) to environmental conditions. In similar fashion, it is unlikely that heat deviations randomly affect some farmers and not others in a community. Instead, it is more plausible that more vulnerable households, whether it be due to low land quality, lack of adaptation in the past, inadequate resources, etc., experience the heat-induced crop shocks. By construction, the sample of observations that I focus my study on are the households that did not experience a crop shock but observed the losses of their neighbors; that is, observations that are more protected from environmental conditions and better off than their counterparts.

The overall pattern of reallocation into agricultural self-employment with decreases in agricultural wage employment and ex ante increases in domestic migration are consistent with the ex post findings of Jessoe, Manning, and Taylor (2018) in a distinct sample of rural communities in Mexico.[10] In the context of their study, they frame ex post migration and local labor allocation changes as part of longer-term, general equilibrium shift in labor influenced by climate-induced agricultural outcomes. They find evidence of ex post increases in migration and reductions in aggregate, wage, and nonfarm employment in response to extreme heat from 1980 to 2007.

Domestic migration to an urban or distant location appears to offer the most relevant avenue for ex ante adaptation to the likelihood of future climate-induced crop losses, particularly for households with more labor, less land, and lower asset endowments. Relative to ex post labor responses, I find suggestive evidence that ex ante migration and local labor reallocations represent a larger share of the total migration and local labor response—ranging from 25 to 60 percent—than might be expected. While ex post effects and responses are of first-order concern after a climate-induced crop shock, the relative magnitude of ex ante responses is noteworthy.

This study makes two key contributions. First, I demonstrate that individuals do mitigate against the increased probability of destabilizing climate events in an anticipatory manner through labor decisions, particularly through domestic migration, substantiating ex ante concepts introduced by Rosenzweig and Stark (1989). Despite being discussed for decades, the notion of ex ante adaption has received relatively little empirical attention. In a fashion similar to that of Dillon, Mueller, and Salau (2011), I show that migration is an important anticipatory adaptation strategy. Domestic migration, in particular, can serve as a way to mitigate the adverse effects of climate shocks, in addition to more commonly studied ex post labor reallocations (Kochar, 1999; Jessoe, Manning, and Taylor, 2018).[11] More generally, this contributes to the evidence base showing that rural households do insure themselves through risk management practices in addition to consumption smoothing (Alderman and Paxson, 1994).

Second, evidence of ex ante migration may help clarify so-called adaptation gaps (Carleton and Hsiang, 2016). Although perceptions of risk have been shown to increase after exposure to

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As a result, the households I study are less likely to adjust their labor allocations and the estimates of migration or local labor responses that I present are likely attenuated (i.e., represent lower bound estimates).

[10] They rely on data from the Encuesta Nacional a Hogares Rurales de México (ENHRUM).

[11] Also see Graff Zivin, Hsiang, and Neidell (2015) as well as Burke, Hsiang, and Miguel (2015).

climate shocks, such as sustained temperature extremes (Deryugina, 2013), flooding (Siegrist and Gutscher, 2006), landslides (Lin, Shaw, and Ho, 2007), and hurricanes (Brown et al., 2018), adaption levels appear to be low.[12] The appearance of suboptimal adaptation to climate change may be partially explained by the nearly exclusive focus on the ex post effects and responses to climate change. This remains true even if only a fraction of individuals and households rationally update expectations and adapt income-generating portfolios prior to the onset of future climate shocks. This research also advances the limited evidence base on ex ante responses (Rose 2001; Dillon, Mueller, and Salau 2011) (i) by featuring the nonlinearity in temperature events relevant to both ex ante and ex post responses as part of a novel research design, (ii) by modeling responses with respect to the increased probability of a specific type of observable event (i.e., heat-induced crop losses), (iii) as well as by comprehensively testing a full set of labor outcomes (local and migration) separately for females, males, and altogether.

This research has three important policy implications relating to projections of future migration, the potential intensification of risk and inequality, as well as the design and implementation of climate risk mitigation programs. I detail these in the discussion (Section 9). The remainder of this manuscript is organized as follows. Section 2 introduces the related literature, which is followed by the hypotheses I develop from a theoretical framework in Section 3. In Section 4, I discuss the data and key variables, and I then present descriptive statistics in Section 5. Section 6 lays out the empirical strategy, and Section 7 presents the results. In Section 8, I offer robustness checks and discuss caveats. Finally, I discuss the findings and their policy implications in Section 9.

2. Anticipatory Adaptation and Climate Responses

In this section, I briefly review the literature on ex ante adaptation and relate it to the more developed scholarship on ex post migration and local labor responses. Drawing on insights from these literatures, I highlight conceptual points that underpin this research.

Although it has been studied sparingly, the notion that rural, agricultural households may adapt to shocks in an anticipatory manner to reduce future risk is not new. For instance, Rosenzweig (1988a, 1988b) and Murdoch (1990) articulate these ideas as part of a larger

[12] For more evidence on flooding, see Botzen and van den Bergh (2012). For more evidence on hurricanes see Peacock, Brody, and Highfield (2005) as well as Viscusi and Zeckhauser (2006).

conversation regarding the extent to which households smooth consumption in the face of transitory shocks. Perhaps the most prominent, early examples of evidence consistent with ex ante responses to shocks are provided by Rosenzweig and Stark (1989) as well as Rosenzweig and Binswanger (1993).[13] While neither study directly accounts for the temporal dimension of adaptations to shocks in order to disentangle ex ante from ex post responses, they find evidence in support of anticipatory motives to reduce risk in India. To the extent the transitory shocks they model are unexpected, adaptations to shocks can be interpreted as ex ante (Rose, 2001).

Rosenzweig and Stark (1989) show that rural households in India mitigate against future local risk in the context of incomplete information by marrying daughters to families within kinship networks outside of their own communities. They represent weather risk as the correlation in daily rainfall over a 10-year period for six villages and demonstrate that it is decreasing in the distance between the villages with which households engage in marriage-migration.[14] Using the same data, Rosenzweig and Binswanger (1993) show that the composition of household asset portfolios is sensitive to weather risk, in addition to risk aversion and wealth, in the context of credit constraints. They represent weather risk as the coefficient of variation for the timing of the rainy season and demonstrate that households choose asset portfolios that are less sensitive to rainfall when exposed to heightened weather risk.[15]

The unifying ideas linking these studies is that risk averse households can mitigate against future transitory, covariate weather shocks by diversifying the composition of their productive assets or the risks associated with them over space in order to minimize variability in consumption over time. This is consistent with the underpinnings of the new economics of labor migration, which posits that households engage in migration to diversify risk over space—an objective that need not be consistent with maximization of expected returns. Moreover, migration in these instances need not be permanent. Indeed, temporary migration would be perfectly consistent with this type of risk-mitigating behavior (Dustmann and Görlach 2016).

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[13] Limited examples of economics research on anticipatory effects or responses include those from Morrison (1985), Loewenstein(1987), Kolstad, Ulen, and Johnson (1990), Shogren and Crocker (1991), Bernheim and Thomadsen (2005), French (2005), Malani and Reif (2015), Fetter and Lockwood (2016), and Matsuda (2018).

[14] They also show that households with more variable profits engage in longer distance marriage-migration as a way to further diversify future risk.

[15] They also demonstrate that (i) profits are sensitive to the onset of the rainy season and that (ii) while safer asset portfolios are less susceptible to weather risk, they are also less profitable.

Ex ante risk mitigation has not received much theoretical or empirical attention, in part due to the identification challenges associated with distinguishing between ex ante responses to future risks and ex post responses to the realization of shocks over time. Rose (2001) and Dillon, Mueller, and Salau (2011) provide two instructive exceptions. Rose studies ex ante and ex post local labor supply responses to covariate weather risk over a four-year period (1968–1971) in 13 states in India. She defines ex ante local labor responses as those driven by uncertainty in the distribution of rainfall, which she represents as the coefficient of variation for annual, district-level rainfall for an overlapping 22-year period (1960–1981). In the context of non-separable labor and production decisions due to incomplete information, Rose finds evidence of a positive ex ante local labor response to volatility in the prevailing rainfall distribution.[16] Dillon, Mueller, and Salau study ex ante and ex post domestic migration originating from four villages in northern Nigeria over a 21-year period (1988–2008). They represent the weather risk distribution as the coefficient of variation of temperature degree days over an overlapping 26-year period (1983–2008), which they interact with household land. In the context of market imperfections, they find suggestive evidence of ex ante domestic migration among males in response to temperature risk.[17]

Despite recent attention to the theoretical importance of anticipatory adaptation to climate change (Mendelsohn, 2000; Bardsley and Hugo, 2010; Sander, Abel, Riosmena, 2014), empirical investigations of ex ante adaptation are scarce. In contrast, scholars have produced a growing body of evidence about the ex post influence that the climate events have on migration and local labor. The influence of climate change on migration is mixed. In many cases, including in Mexico, Nigeria, Bangladesh, and Ecuador, extreme heat or a lack of precipitation has been shown to increase the probability of migration (Feng, Krueger, and Oppenheimer, 2010; Gray and Mueller, 2012; Gray and Bilsborrow, 2013; Jessoe, Manning, and Taylor, 2018).[18] However, in other cases, climate shocks have been shown to decrease migration due to the adverse effect they have on the resources required to finance migration journeys (Cattaneo and Peri, 2015). In addition, the impacts of climate change on labor have been shown to be wide ranging, from reducing work

[16] Rose also finds stronger evidence of an ex post increase in local labor associated with rainfall shocks.
[17] They also find stronger evidence of an ex post migration response among males, while it appears that fewer females engage in ex post migration.
[18] Also see Munshi (2003), Halliday (2006), Hornbeck (2012), Hunter, Murray, and Riosmena, (2013), Bohra-Mishra, Oppenheimer, and Hsiang (2014), Cai et al. (2016), Nawrotzki and DeWaard (2016), Gröger and Zylberberg (2016), and Riosmena, Nawrotzki, and Hunter (2018).

intensity (Hsiang 2010), cognitive performance (Graff Zivin, Hsiang, and Neidell, 2015), and productivity (Traore and Foltz, 2017) to reallocating local labor across sectors (Jessoe, Manning, and Taylor, 2018) and reducing aggregate economic growth (Burke, Hsiang, and Miguel 2015). Taken together, this growing literature also demonstrates that these ex post effects and responses are not homogenous. They are shaped by wealth, gender, and social norms, as well as types of migration (domestic or international) and employment (agricultural, nonagricultural, self-employment, and wage) opportunities that are available to individuals and the household as a whole.

This focus on the ex post influence of climate change has resulted in a nearly exclusive emphasis on the direct effects of climate shocks. An unintended consequence of this is the general lack of consideration for the information about climate shocks that can be learned from others, which represents an indirect but informative channel about climate risk. Learning from others is a central concept in the agricultural technology adoption literature (Besley and Case, 1994; Foster and Rosenzweig, 1995; Munshi, 2004; Bandiera and Rasul, 2006; Conley and Udry, 2010).[19] The fundamental idea is that the experiences of neighboring households are informative in the context of imperfect knowledge about a technology. This literature is also instructive in thinking about responses to climate change. Much like adaptation choices, decisions to adopt are likely correlated with previous shock experiences and profit outcomes. This is an issue that Foster and Rosenzweig (1995) attempt to resolve (in the context of studying how the adoption of new technologies influence profits) by relying on village-level measures and an IV approach.

Several conceptual features in the aforementioned studies frame this study. First, individuals are risk averse, and as a result, even modest increases in the risks they face can result in substantive changes to the income-generating portfolios of their households. Second, individuals are subject to information frictions regarding the expected income effects of intensifying climate risks, such as high heat or low rainfall, and this uncertainty shapes the choices agents take to insure against climate shocks. Third, individuals can reduce this uncertainty by learning about the adverse effects of evolving climate risks through agricultural outcomes on their own plots, as well as the agricultural outcomes of other households in their communities. Combined, these experiences provide a clearer signal of prevailing climate conditions and their influence on agricultural crop

[19] Also see Oster and Thornton (2012), Cai, de Janvry, and Sadoulet (2015), Magnan et al. (2015), and Maertens (2017).

outcomes. Finally, labor market allocation choices, including migration, are fundamentally important options for poor households attempting to adjust their portfolios based on these signals.

3. Labor Choices in Rural Households and Learning about Risk from Others

The theory underpinning this study rests on the consumption decisions and labor allocations of infinitely lived, risk averse rural individuals nested in households. Consumption outcomes and labor decisions over time are influenced by climate risk and the uncertainty surrounding it. The intensifying and stochastic nature of high-heat and low-precipitation events represent an information friction that constrains optimal mitigation to climate change. Households learn about the risk of climate-induced crop losses through agricultural outcomes of their household, as well as the agricultural outcomes of surrounding households in their communities. In particular, they learn about the probability of experiencing a catastrophic crop loss due to extreme heat. Learning from others informs economic agents about both the magnitude and variability of agricultural climate risk, thereby reducing the uncertainty surrounding it.

This model of consumption and labor decisions in the face of climate risk builds on formative ideas presented by Deaton (1991) and Bryan, Chowdhury, and Mobarak (2014), while incorporating features from Foster and Rosenzweig (1995) and Rose (2001). A blend of Deaton's and Bryan, Chowdhury, and Mobarak's models of savings, liquidity constraints, and migration provide the foundation. Rose introduces the role of climate risk in a model of household labor, while Foster and Rosenzweig incorporate learning from others in a technology adoption model, which is analogous to the labor allocation issue considered here.

With these concepts in mind, consider the case of individuals in households located in rural communities, whose consumption in a given period depends on earnings from agricultural self-employment or an alternative activity such as nonagricultural work or migration and remittances. Agricultural self-employment represents a default activity that is disproportionately subject to local climate risk determining crop outcomes, relative to nonagricultural work and migration. Nonagricultural work is indirectly exposed to climate risk through its dependence on the performance of the agricultural sector for inputs and the influence it has on the demand and supply for labor in the community. On the other hand, migration is not directly associated with the risk of climate-induce crop shocks.

The objective of a risk averse agent is to maximize welfare. This entails maximizing expected utility while diversifying risk by adjusting labor allocations to smooth consumption in the context of harmful heat spells that translate to catastrophic crop losses for some plots and households, but not others. Heat-induced crop losses are more likely for vulnerable households whose productive endowments are unsuitable to extreme heat, but also depend on the intensity with which temperatures are experienced on specific plots. This is a function of the time in the day when peak heat is experienced, the direction and slope of plots, the amount of potentially protective precipitation, and the quasi-random timing and spatial footprint of weather fronts. Hence, extreme heat is not perfectly covariate, and as a result, households may avoid destabilizing crop shocks because they are more protected or due to luck.

Reallocating labor across agricultural self-employment, nonagricultural work, and migration to mitigate risks hinges on the extent to which households learn about the probability of climate-induced crop losses through their own agricultural outcomes and the agricultural outcomes of surrounding households in the face of noisy climate conditions. Households repeat consumption and labor allocation decisions in each period, building off the knowledge and wealth they accumulate. Both nonagricultural work and migration represent progressively less risky income-generating activities than the default option of agricultural self-employment. Allocating labor across these distinct options may provide an opportunity to diversify risk and self-insure against future climate-induced crop losses. This is, however, challenging for a number of reasons.

First, the expected income-effects of risks associated with extreme high heat or a lack of precipitation are not easily predictable. Households can learn about these adverse effects via agricultural outcomes on their own plots and those of other households, but the learning process is noisy. Second, climate risks are intensifying in the context of climate change, and there is a stochastic element to this amplification of risk. These features combine to create information frictions that inhibit optimal, perfect-information-based portfolio management in the presence of well-functioning credit markets, which is unlikely. The presence of incomplete markets is may result in additional constraints. The combination of information frictions and incomplete markets is likely to exacerbate uncertainty about expected income effects and capacity to mitigate against climate change.

Learning from the agricultural outcomes of others in the community represents an opportunity for households to deepen their knowledge about the likelihood of heat-induced crop shocks. This information not only provides additional evidence about the risk of future crop loss but also improves the precision of the inherently noisy signal associated with stochastic climate events, in similar fashion to that of Foster and Rozensweig (1995). Households weight this signal according to the similarity of their characteristics, endowment, and agricultural engagement relative to others in the community.

Households then pursue an optimal mix of labor allocations to maximize expected utility and smooth consumption over states and time. This is conditional on the stability of the prevailing nature and level of climate events in the short term, as well as the similarity of households to others in the community that they can learn from. This becomes increasingly difficult as the likelihood of experienced climate-induced crop shocks and, more generally, the distribution of climate events changes. Poor households without assets to draw down, or information about profitable nonagricultural and migration opportunities, may be relegated to default, agricultural self-employment. This is particularly true for households without excess labor who own land, which may serve as a risky but tangible safety valve. The changing composition of household labor endowments may also play an influential role in this process over time.

Importantly, labor decisions are not limited to ex post labor responses to shocks. Ex ante portfolio adjustment in anticipation of riskier agricultural growing conditions, such as future climate-induced crop shocks, is also feasible. In fact, if we take a dynamic, intertemporal framework at face value, then individuals and households that optimize expected utility should consider both ex ante (anticipatory) and ex post (reactionary) labor adaptation to climatic risks. This is particularly true in the case that households receive credible signals about the likelihood of climate-induced crop shocks from the agricultural outcomes of similar households in their communities.

Based on this theoretical framework of how individuals and households learn about the expected income effects of climate risk through crop outcomes on their own plots and those of their neighbors, I posit the following three central hypotheses regarding individual level behavior:[20]

[20] While the household is the relevant economic unit, especially for agricultural production and learning about the potential adverse effects of climate events, migration and local labor outcomes are ultimately individual-level phenomena. In addition, posing hypotheses at the individual-level effectively relaxes the assumption that preferences are homogenous within the household central to the unitary household model.

H1. Ex ante: Individuals respond to the prospect of climate-induced crop shocks through ex ante labor adjustment.

H2. Adaptation: Ex ante labor allocations are made into migration and nonagricultural employment to mitigate the climate risks associated with crop losses.

H2.A. Migration: Individuals from households with lower land-labor ratios and migration experience are more likely to pursue an ex ante migration strategy.

H2.B. Land: Individuals from households with higher land-labor ratios are more likely to reallocate labor onto their own land in response to changes in the demand for labor, returns to agriculture, or as a last resort in the context of climate risk.

H3. Gender: Ex ante adaptations to climate-induced crop shocks and responses to local labor dynamics are heterogeneous, owing to gender-differentiated patterns in labor market opportunities, access to endowments, and sociocultural norms.

H3.A. Agricultural Engagement: Men will be more responsive to the climate induced crop shocks of others given their increased engagement in agriculture, particularly with respect to changes in local labor allocations.

H3.B. Migration Engagement: Women and men's domestic migration responses will be more similar than their international migration responses. This distinction is based on prior migration patterns from rural Mexico, which are similar for domestic migration. In contrast, international migration has historically been driven by males.

4. Data

Exploring whether individuals reallocate labor in anticipation of climate shocks requires information from distinct types of sources: panel household-level socioeconomic and demographic data, high-resolution weather data, as well as agricultural and population census data. The combination of these must facilitate (i) measuring spatially referenced daily temperature at a high degree of resolution over time, (ii) characterizing how extreme heat events influence agricultural crop outcomes, (iii) observing households in rural communities in sufficient detail to identify crop losses among households that experienced heat-induced crop shocks, (iv) detecting the labor responses of individuals in households that did not experience catastrophic crop losses, and (v) describing the agricultural, economic, and sociodemographic context shaping agricultural outcomes and labor decisions.

To this end, I integrate panel socioeconomic data for rural households in Mexico from the Mexican Family Life Survey (MxFLS: Rubalcava and Teruel, 2013) with longitudinal meteorological data for the municipalities where they reside, from NASA's Agricultural Modern-Era Retrospective Analysis for Research and Applications Climate Forcing Dataset for Agricultural Modeling (AgMERRA: Ruane, Goldberg, Chryssanthacopoulos, 2015). The MxFLS provides detailed information about household crop shocks from 1997 to 2005, as well as individual migration from 2002 to 2005 and local labor decisions in 2002 and 2005. AgMERRA provides daily average temperature and precipitation data throughout Mexico from 1980 to 2010 at 0.25° resolution, which I integrate with the MxFLS at the municipality level. I additionally incorporate data at the municipality level from Mexico's 2000 Population Census (INEGI, 2000) and 2007 Agricultural Census (INEGI, 2013), which includes retrospective questions, and the Mexican National Council of Population (CONAPO, 2011; 2012).

4.1 Socioeconomic and Demographic Data: Migration and Local Labor Variables

The MxFLS is a nationally representative, multitopic survey collected in 2002, 2005, and 2009–2010. Owing to the empirical strategy described below and the years in which there is sufficient variation in temperature and agricultural outcomes, I rely on the first two rounds of data for this analysis. The 2002 wave of the MxFLS interviewed 8,440 randomly sampled households in 150 communities from 136 municipalities in 16 states. Figure 1 demonstrates the expansive spatial distribution of the 136 municipalities included in the MxFLS sample. An average of 55 households were randomly sampled in each community. This is an important feature of the MxFLS, because the relatively large number of households surveyed in each community allows me to characterize the prevalence of crop losses at the community level.

This study focuses on the labor responses of roughly 3,000 individuals aged 15 and up from more than 1,200 households that own or use land and did not experience heat-induced crop shocks but observed crop losses in their rural communities with less than 2,500 inhabitants. They are located in 45 rural communities in which at least 40 percent of households report land ownership or use. Each community is nested in a distinct municipality across 12 states. These restrictions are imposed to study anticipatory labor behavior among the types of households and communities where ex ante behavior is most likely: households with land in communities that rely on agriculture. More than 90 percent of the households surveyed in 2002 were reinterviewed in 2005 (Rubalcava, 2007; Rubalcava and Teruel, 2013). The vast majority of households that attrited are thought to be cases where all members relocated outside of the origin community but remain within Mexico. I exploit this detail to bound domestic migration estimates, as detailed further below.

[Figure 1]

The MxFLS is an ideal source for constructing measures of individual-level migration. Each survey includes detailed modules on permanent migration (one year or more) and temporary migration (more than a month but less than a year) of individuals. Based on this information, I create variables measuring international and domestic migration ($\mathbb{Y}_{\mathrm{it}}$) from 2002 to 2005 (an aggregate measure), from 2002 to 2003 (immediately after the exposure to the heat-induced crop losses of others), and from 2004 to 2005 (a measure of lagged or sustained migration).

I construct comprehensive measures of domestic and international migration during 2002–2005 using information from reported migration journeys, supplementary information in the survey on the location of individuals over time, and detailed tracking information collected along with the 2005 round of the survey. Reported migration journeys are documented in the aforementioned survey modules on temporary and permanent migration. Supplementary information refers to data on the location of household members from the roster and module a proxy questionnaire. Tracking information is collected by the MxFLS outside of the survey itself and documents if a household member migrated between the 2002 and 2005 survey rounds, regardless of if such a journey was reported in the temporary or permanent migration modules. The tracking information, however, does not include data on the timing of the migration journey.

The tracking information is useful for confirming an individual's residence outside of the community in 2005. The tracking information is also particularly important for documenting the migration journeys of individuals who otherwise appear to have attrited out of the survey panel. As a result of the inclusion of this information in the aggregate 2002–2005 migration variables, they represent considerably more comprehensive measures of migration during the study period, especially for international migration. This is because the MxFLS prioritized the tracking of international migrants, which results in considerably less complete tracking information for domestic migrants.

Bearing this in mind, I construct two domestic migration variables for the 2002–2005 period: a lower bound based on reported migration journeys, which includes cases where journeys were not reported in the migration modules but supplementary or tracking information pinpoints an individual's residence outside of the community, and an upper bound that also classifies all remaining (potentially attrited) individuals as domestic migrants as migrants. As noted previously, the majority of these cases appear to be entire households that relocated, and it is believed that they did so within Mexico. In the case of international migration from 2002 to 2005, I construct a single variable owing to the more detailed tracking information recorded for migrants outside of the country. All individual-level migration variables are binary (0/1), with a value of 1 indicating that the individual engaged in the specific type of migration during the specified time period ($\mathbb{Y}_{it} \in \{0,1\}$). The MxFLS also includes retrospective questions about migration histories, which are useful for characterizing previous migration experience within the household.

The 2002–2003 and 2004–2005 variables, on the other hand, are constructed solely based on the reported journeys for the subset of observations that reported the timing of their migration. They do not include information about location from other modules in the survey or tracking information that only becomes available in 2005. As a result, these variables underestimate the extent of initial migration during 2002–2003 and sustained migration during 2004–2005, particularly for international migrants who neither report their journeys nor the timing of their migrations as consistently. The year to year variables account for the vast majority of domestic migration (71 to 95 percent), but reflect only a fraction of the international migration that is captured through the 2005 tracking exercise (18 percent). As a result, when drawing inferences about international migration I primarily rely on the 2002–2005 variable.

Information on the local labor participation of individuals in the community is collected in a separate module. In particular, it asks a series of questions characterizing primary work in the last week and the previous 12 months as agricultural, nonagricultural, self-employment, or wage work.[21] This allows me to create individual-level, local labor variables for agricultural self-employment, agricultural wage-employment, nonagricultural self-employment, and

[21] Secondary occupations are not commonly reported.

nonagricultural wage employment in 2002 and again in 2005 ($\mathbb{Y}_{it}$). Like the migration variables above, these are formulated as binary indicators (0/1).

The MxFLS also includes a detailed module on annual shocks experienced in the household, including an accounting of whether households experienced a catastrophic crop loss, beginning in 1997. I focus on household reports of crop shocks during 2000–2002 (inclusive of the first round of the MxFLS) and, as described in the next subsection, information on extreme temperatures over the same 2000–2002 exposure window to characterize climate shocks. In order to assess if individuals reallocate labor in response to the crop losses of others, I summarize crop losses as the proportion of other households sampled in the community that experienced a heat-induced crop shock during 2000–2002 ($\mathbb{A}_{c02} = \{0 \ldots 1\}$).[22] The MxFLS also collects information on the type and size of land owned or used by each household, which serve as important measures of agricultural engagement, productivity, and vulnerability, as well as a proxy for wealth.[23]

The multitopic nature of the MxFLS also enables the inclusion of a rich set of controls ($\boldsymbol{X}_{02}$) that may be influential in shaping agricultural outcomes and labor allocations. These include the following:

i) Individual-level characteristics: age, sex, and years of education.

ii) Household-level characteristics: household size, previous migration experience, land size, land type, use of credit, and access to piped water in the home.

iii) Community-level factors: access to infrastructure such as a hospital, secondary school, and market

I also include municipality-level characteristics in this analysis from Mexico's 2000 Population Census and 2007 Agricultural Census, the Mexican National Council of Population (CONAPO), which are important in controlling for demographic, agricultural, and economic

[22] By virtue of relying on the analytical sample of individuals in households that did not experience a crop shock, this measure of community crop loss does not reflect their own experiences. If this analysis were extended to the full rural sample, omitting the household's own experience would guard against endogeneity by ensuring that potential responses can be attributed to *learning from others*.

[23] The MxFLS does not disclose information on the type or number of crops that households cultivate, to ensure the confidentiality of survey participants. This, unfortunately, renders the relatively detailed module on agricultural production unsuitable for more detailed analysis on the temperature-agriculture relationship.

contextual factors.[24] The Population Census provides information from 2000 on population, economic diversity, and historical migration. The Agricultural Census provides retrospective information from 2000 on the percentage of land irrigated and under cultivation of specific crops such as maize and coffee. Finally, CONAPO offers information from 2000 on marginalization and historical migration intensity.

4.2 Weather Data: Temperature Variables

I use NASA's gridded AgMERRA to create average temperature variables. AgMERRA provides daily average temperature and precipitation data throughout Mexico from 1980 to 2010 at 0.5° resolution for temperature and 0.25° for precipitation.[25] I integrate average temperature and precipitation variables with the aforementioned socioeconomic and demographic sources at the municipality level, which is the lowest administrative unit that is identifiable in the MxFLS.[26]

The strength of AgMERRA is its improved representation of daily weather, including extreme temperatures and precipitation, that is crucial for modeling agricultural outcomes and associated behavior (Ruane, Goldberg, and Chryssanthacopoulos, 2015). AgMERRA takes into account environmental information that is collected directly from ground stations and remotely-sensed, as well as other reanalysis and climate forcing datasets, to improve the accuracy and resolution. In the past, researchers have typically relied on monthly, instead of daily, weather data. Monthly weather data is, however, likely to understate the influence of weather nonlinearities, particularly the crossing of extreme thresholds, due to the smoothing (averaging) of daily information when aggregated to the monthly unit. I process the spatial AgMERRA data to generate measures of average temperature and precipitation at the municipality level during 2000–2002 that are suitable for regression analysis.

Reflecting the nonlinearity in weather realizations, as well as their frequency and duration, guides my approach. This is rooted in the idea that weather extremes or anomalies, as opposed to modest fluctuations, are most influential in determining growing conditions, agricultural

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[24] See Riosmena, Nawrotzki, and Hunter (2018) for a more detailed description of these control variables.

[25] One degree (°) of resolution in terms of latitude or longitude roughly corresponds to a distance of approximately 111 kilometers and a grid cell of more than 12,000 square kilometers, so spatial data with 0.5° resolution corresponds to an area of over 3,000 square kilometers.

[26] It would ideally be feasible to link the weather data at a more disaggregated level, such as the community, but it is not possible with the MxFLS.

outcomes, and related human behavior. In other words, weather variables must capture when critical high temperature thresholds are crossed and for how long they are sustained, because it is these types of temperature events that are most likely to influence agricultural outcomes and motivate human responses to climate change. Dell, Jones, and Olken (2014) provide a detailed summary of techniques that explicitly reflect the occurrence, frequency, and duration of weather extremes.

I focus analysis on extreme temperatures for a number of reasons. First, a body of evidence has emerged that extreme temperature events are considerably more influential in determining agricultural outcomes than rainfall (Schlenker, Hanemann, and Fisher, 2005; Lobell and Burke, 2008; Schlenker and Roberts, 2009; Auffhammer, Ramanathan, and Vincent, 2012), which earlier scholarship had relied on. Second, I observe far less variation in daily precipitation than average temperatures in Mexico from 1980 to 2010 (see Figure A2 in the Appendix). This is particularly true for the period 2000–2002, which coincides with the catastrophic crop losses documented in the first round of the MxFLS in 2002.

In order to reflect the occurrence, frequency, and duration of extreme temperatures that cross important thresholds for agricultural production, I construct two variables with a similar structure for the 2000–2002 exposure period ($\mathbb{T}_{m02} \in \mathbb{Z}^{+}$): the total deviations spell and the total harmful degree days (HDD) 30 ℃ spell. In both cases, I first count the number of days in a year when average temperature exceeds an extreme heat threshold (described further below). Second, I identify the longest spell of consecutive days when the extreme heat threshold is crossed. Third, I sum the number of days when the threshold is exceeded during the maximal spell. Finally, I add the number of days associated with each maximal spell in 2000, 2001, and 2002. This allows me to capture the nonlinearity, frequency, and duration of extreme heat events in a single summary measure for each municipality over the 2000–2002 exposure window.[27]

I use two distinct thresholds for the temperature variables. In the first case, I calculate the daily Z-score for the average temperature realization in each day during 2000–2002. As an intermediate step, this involves calculating the average historical temperature and standard

[27] As noted in the previous subsection, catastrophic crop loss reports are available on an annual basis. I aggregate up to three-years to provide a wider exposure window, which gives individuals time to learn about the climate risks to their income and respond through labor allocations.

deviation from 1980 to 1999 for each day.[28] Then, for an average temperature (e) on a given day (d) from 2000 to 2002 (t) in a municipality (subscript suppressed for convenience), I compute

$$z(e_{dt}) = \frac{e_{dt} - \bar{e}_{d1980:1999}}{\sigma(e_{d1980:1999})}, \quad (1)$$

where $\bar{e}_{d1980:1999}$ is the mean temperature for said day over the historical period and $\sigma(e_{d1980:1999})$ is the standard deviation.

Finally, I identify the days where temperature *Z*-scores exceed +1 standard deviation. In other words, I define daily extreme heat events as

$$z(e_{dt}) > 1, \quad (2)$$

at which point I apply the algorithm described above to compute the total deviations spell for 2000–2002 $(\mathbb{T}_{m02}(z(e_{dt}))$ for municipality $m)$. This strategy emphasizes the influence of proportional-level changes relative to typical variation in the past. While this approach is potentially susceptible to measurement error given the mean and standard deviation terms,[29] it also has a major advantage. It reflects the occurrence of extreme temperature events that are abnormal for each municipality given its unique conditions. This is important because households are likely to have adjusted their agricultural activities to the prevailing conditions in the municipality. In this way, this measure may be more closely related to updating behavioral expectations with respect to an increased risk of extreme heat.

The second temperature variable is attractive not only because it requires far fewer steps and is therefore less susceptible to measurement error, but also because it is based on the agronomic knowledge that accumulated heat exposure during a growing season is most influential

[28] A long time horizon, approaching a climate normal period of 30 years, is ideal for calculating a deviation from an expected value.

[29] Measures of weather over long periods of time are particularly susceptible to data problems associated with inconsistent reporting of weather information over time (Dell, Jones, and Olken 2014). These types of data issues can translate into classic measurement error and attenuation bias when measures of weather anomalies are constructed based on limited or noisy data. The AgMERRA data are regarded as among the highest-quality data currently available to researchers.

in determining crop growth (Herrero and Johnson, 1980; Bassetti and Westgate, 1993). The basic idea in the growing degree days (GDD) approach is that plants grow optimally when exposed to temperatures that are not too low or high. On the other hand, when they are exposed to harmful degree days (HDD) below or above critical thresholds, plants can no longer absorb appropriate levels of heat, which stunts their growth. The growing literature on climate change has consistently confirmed the negative impacts of crossing extreme heat thresholds on crop outcomes (Schlenker, Hanemann, and Fisher, 2005; Lobell and Burke, 2008; Schlenker and Roberts, 2009; Auffhammer, Ramanathan, and Vincent, 2012).

With this in mind and following the approach as above, I alternatively define extreme heat events as days where

$$e_{dt} > 30°\text{C} \,, \tag{3}$$

and, once again, apply the aforementioned algorithm to calculate the total HDD 30°C spell for 2000–2002 $\left(\mathbb{T}_{m02}(e_{dt})\right)$. This is similar to the threshold that Schlenker and Roberts (2009) study with respect to maize in the United States. They find that maize yields fall by an average of 48 percent when temperatures rise beyond 29 °C. Similarly, Jessoe, Manning and Taylor (2018) define extreme heat as being above 32 °C in their study of ex post labor responses in Mexico. In the context of this study, catastrophic crop losses appear to be most responsive to days when average temperatures exceed 30 °C, which is consistent with the aforementioned research.[30]

5. Descriptive Statistics

Figure 2 demonstrates the increase in average annual temperatures in Mexico from 1980 to 2010. Each rural municipality included in the MxFLS is presented in its own column, from the municipalities with the lowest average temperature on the left to those with the highest average temperature on the right. Annual average temperatures are presented in progressively darker hues from 1980 in light gray up to 2010 in dark red. The light lower layer and dark upper layer in the plot provide striking visual evidence of increasing temperatures over time. This is indicative of an increased probability of climate-induced crop shocks and a shifting climate distribution. This is

[30] Jessoe, Manning, and Taylor (2018) also note that optimal growing conditions for corn are above 20 °C.

true across the spectrum of low, medium, and high average temperature municipalities. Figure 2 also illustrates that the broad spatial distribution of municipalities included in the MxFLS translates to considerable variation in temperatures across the data sample. In contrast, there is no clear variation in annual precipitation over the period (see Figure A2 in the Appendix).

[Figure 2]

Table 1 presents descriptive statistics (means) for the outcomes of interest in the analytical sample: international and domestic migration, as well as agricultural self-, agricultural wage, nonagricultural self-, and nonagricultural wage employment. Roughly 5 to 7 percent of individuals engaged in domestic migration during 2002–2005, with slightly more of it taking place in in the first two years of that period. The percentage of domestic migrants is nearly identical for females and males over this period. Approximately 5 percent of individuals participated in international migration during 2002–2005, with the majority being male. As noted above, the year to year international migration variables capture only a small fraction of journeys outside of Mexico so I place far more weight on the results for the 2002–2005 international migration variable than the year to year measures.

Nonagricultural wage work is the most common type of local employment, followed by agricultural self-employment. We observe a decrease in the local labor devoted to each category over the four-year period.[31] In contrast to migration, the structure of the local labor market is clearly gendered. Males dominate agricultural self- and wage employment in both periods. Although the largest proportion of females participate in nonagricultural employment work, males also participated in this type of work at a higher rate. Nonagricultural self-employment is the only exception in which male and female participation are roughly equivalent in the analytical sample. Although we observe a small reduction in nearly all employment categories over time, these changes are not substantial and represent roughly the same proportion of local labor over time. As such, this pattern is not indicative of a widespread general equilibrium shift in the supply or demand of labor, which is not surprising given the relatively short period of time (especially relative to the results of Jessoe, Manning, and Taylor, 2018).

[31] This implies an increase the percentage of individuals who do not report an income generating activity in 2005.

[Table 1]

Table 2 presents descriptive statistics (means and standard deviations) for key variables including the community proportion of crop loss and measures of sustained extreme heat during 2000–2002. Approximately 8 percent of households in the analytical sample reported catastrophic crop losses, though the standard deviation of 10 suggests considerable variation in this measure. In fact, the proportion at the community level ranges from the single digits to over 60. The total number of days of sustained extreme heat spells during 2000–2002 that households are exposed to, as defined above, ranges from approximately 17 to 26 days. The standard deviations suggest considerably more variation in the HDD 30 ℃ spell measure than the deviations variable.

[Table 2]

On average, households own or use nearly 5 hectares of land, most of which is part of an *ejido*. Households can own or use different types of land. The two most common types are ejido land, which 74 percent of households report, and private land, which is reported by 21 percent of households. Approximately 36 percent of land is irrigated and maize accounts for the largest proportion of crops in the municipalities where they reside. Around 40 percent of households report migration experience prior to 2000, and average household size is over 4.5 in the analytical sample. Descriptive statistics for additional control variables are available in Table A1 of the Appendix.

6. Empirical Strategy

This study focuses on uncovering the ex ante migration and local labor responses of individuals among households that use or own land but did not recently experience a crop shock.[32] Although these households do not experience a catastrophic crop loss during the study period, they do observe the heat-induced crop losses of neighboring households in their rural, agricultural communities. These observations of crop damage to other households provide the basis for

[32] Learning via the crop losses of other households is not likely to be particularly informative for households that do not use or own land.

pursuing ex ante responses to mitigate potential risks of future heat-induced crop shocks. The estimation strategy emphasizes ex ante labor (migration or local labor) responses during 2002–2005 associated with the observation of weather-induced crop losses among neighbors during 2000–2002.

Importantly, this strategy restricts analysis to the subsample of households and individuals for which labor allocations can be characterized credibly as ex ante based on the absence of recent crop losses in the household. A recent crop shock in a household complicates identification of an ex ante response, because it is possible that any observed migration or local labor allocation is, instead, a delayed ex post response. Emphasizing ex ante responses via a learning from others mechanism among households that did not experience a crop loss circumvents the potential overlap with ex post responses to own experiences. As noted previously, I additionally restrict analysis to communities where at least 40 percent of households report land use, to ensure that the learning from others mechanism is plausible.[33] In communities where land use for agricultural purposes is not prominent, it may be more difficult to observe the crop shocks of others. I relax this restriction later in the study. The restrictions on household-level land use and the absence of shocks along with the condition on community-level land use yields an analytical sample of roughly 3,000 individuals of ages 15 and up from over 1,200 households located in 45 rural communities, each of which is in a distinct municipality, clustered within 12 states.[34] One potential concern with this approach is that constructing this analytical sample may result in selecting on the outcome. This, however, appears unlikely as migration is slightly more common in the omitted observations.[35]

Emphasizing learning from others related to imperfect covariate temperature shock implies different degrees of exposure to extreme heat and the presence of information spillovers. These two features of the study context suggest that the standard stable unit treatment value assumption (SUTVA) might be violated. In the following passage, I discuss the features of my approach, the data I use, and how they relate to SUTVA.

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[33] I choose a cutoff of 40 percent because I observe a natural break in the distribution at that point (see Figure A1 in the Appendix).

[34] The number of clusters can be expanded from 45 to 60 by including communities where 20 to 40 percent of households report owning or using land. This does not, however, change the findings of this study in any substantive way, as is demonstrated later in this manuscript.

[35] For instance, previous household experience with migration and municipality migration intensity are slightly lower in the analytical sample (0.424 and 0.084, respectively) than among the excluded observations from households that experienced catastrophic crop losses (0.435 and 0.107, respectively).

A1. SUTVA:

A1.1 Uniform Treatment: All observations receive an identical treatment dose.

A1.2 Non-Interference: Treatment assignment of an observation does not affect (potential) outcomes of other observations.

Although the intensity of extreme temperature experiences is likely to vary for the reasons detailed above in Section 3, including the timing and spatial path of peak heat realizations, extreme heat is measured as being perfectly covariate at the municipality level. In other words, data limitations ensure that the uniform treatment component of SUTVA (**A1.1**) is satisfied in the empirical model with respect to temperatures. In keeping with uniform treatment, I assume that households receive information about the proportion of other households in their community experiencing heat-induced crop shocks homogenously.

I explicitly study the opposite case where heat-induced crop shocks experienced by some households inform the individual-level labor allocations of other households in the community that were not affected similarly by the shocks. I assume non-interference with respect to temperature realizations but allow for interference in information about climate-induced crop shocks within the community. That said, this is not a serious concern because the analytical sample of households I focus on did not experience heat-induced crop shocks so there is minimal scope for interference. The violation of the non-interference component of SUTVA (**A1.2**), which arises in contexts where learning from others is important, potentially complicates inference. I discuss how I overcome this in more detail below.

Migration and local labor responses may coincide with updated expectations about the likelihood of future climate-induced crop shocks and returns to agricultural production, as well as opportunities in the local labor market; however, observing and measuring expectations is challenging. In the remainder of this section I detail a naïve approach to exploring ex ante labor allocations relying on ordinary least squares (OLS) and its associated drawbacks, the IV strategy that I rely on and the extent to which it addresses these limitations, and the steps taken to assess robustness.

6.1 Ordinary Least Squares

Consider equation (4), which quantifies the relationship between the proportion of neighbors' crop shocks in a community ($\mathbb{A}_{c02}$) and labor allocations ($\mathbb{Y}_{it}$). Individuals (i) in households (h) are clustered in communities (c) within municipalities (m) and states (s). For all intents and purposes, communities (c) and municipalities (m) enter equivalently into this empirical exercise, given the one-to-one-mapping described above.

$$\mathbb{Y}_{ihcmst} = \alpha \mathbb{A}_{c02} + \boldsymbol{X}_{ihcm02}{}' \boldsymbol{\pi} + \lambda_s + \epsilon_{ihcmst} \quad . \tag{4}$$

Community crop loss is measured as the proportion of households in the community reporting a catastrophic crop loss from 2000 to 2002. I characterize crop losses in a community with an aggregate measure for two reasons. First, the proportion of households experiencing climate-induced crop loss is readily observable. Second, the aggregate representation of crop loss further simplifies concerns about relating to interference (SUTVA **A1.2**). This is because incorporating a community measure of the crop losses that others learn from circumvents explicitly modeling all the distinct crop shock information flows (spillovers) from household to household and their interdependencies that would otherwise be required to facilitate causal inference.

Labor allocations are treated in a binary (0/1) fashion as individual-level measures of engagement in domestic and international migration from 2002 to 2005, as well as local labor outcomes in 2002 and 2005, such as agricultural self-employment, agricultural wage employment, non-agricultural self-employment, and nonagricultural wage employment. Given the binary dependent variables, estimating this equation with OLS results in a linear probability model (LPM).[36] This is advantageous because the coefficient of interest (α) for the ex ante responses and adaptation hypotheses (*H1* and *H2***)** can be interpreted as the marginal change in the probability that an individual engages in a migration or local labor outcome associated with an increase in the proportion of neighbors experiencing a catastrophic crop loss. The gender heterogeneity hypothesis (*H3*) is explored with a similar setup for female and male subsamples. In the interests of simplicity and ease of interpretation, these outcomes are treated as independent (across specifications) despite the possibility that individuals face a set of related labor opportunities in a given period.

[36] LPMs produce accurate predictions of probabilities for values of variables that approach the sample mean (Wooldridge, 2002).

Whether the correlation represented by α can be considered an unbiased estimate depends on the extent to which equation (4) controls for confounding factors including other variables that have an influence on the migration or local labor outcome of interest, omitted variables, and potential sources of selection. To that end, I include state fixed effects and a vector of individual-, household-, community-, and municipality-level controls. Fixed effects (λ_s) for 12 states serve multiple purposes. First, they focus on identifying variation in community crop losses among relatively similar settings and institutional experiences by accounting for unobserved, time-invariant state-level factors. To be specific, this means that α is identified from variation in deviations from the state average of community crop losses. State fixed effects additionally control for some common institutional experiences, such as persistent labor market conditions and shared migration histories. The vector of control variables represented by $\boldsymbol{X}_{ihcm02}$, which is described in more detail in the following subsection, controls for a set of observable controls that shape engagement in agriculture and associated vulnerability to shocks, as well as those that influence the probability of migration and local labor allocations.

Though state fixed effects and the vector of individual, household, community, and municipality controls represent a relatively comprehensive set of controls, a number of limitations to the specification expressed in equation (4) likely inhibit unbiased estimation. First, (classic) measurement error in catastrophic crop loss reports may attenuate estimates of α toward zero. Second, potential selection at household and community levels may also bias results. Household catastrophic crop loss reports are likely subject to nonrandom selection associated with engagement in agricultural activities and the subsequent vulnerability to crop losses. Households that experience catastrophic crop losses are more likely to be vulnerable to crop shocks, whether it be because of their agricultural engagement, the steps they have not taken to protect themselves, or unobserved features of their agricultural endowments, relative to those that strictly observe the heat-induced crop losses of others. Thus, shocked households are more likely to alter their migration and local labor allocations, and this type of selection likely also attenuates results.

An additional concern is selection at the community level because some communities may be more susceptible to crop shocks than others. This is an issue that can be addressed by incorporating a plausibly exogenous, municipality-level temperature instrument, which is discussed below. Last, this empirical setup, which is commonly referred to as the structural equation of an IV framework, does not explicitly link climate conditions to crop outcomes.

Alternatively, substituting a measure of extreme temperature events in place of crop losses, which transforms equation (4) to what is typically referred to as a reduced-form IV equation, does not pin down the crop loss or learning mechanisms that are central to this study. As Heckman and coauthors note, pinning down mechanisms is of immense value to our understanding of how and why certain behaviors emerge (Heckman, Pinto, and, Savelyev 2012). These considerations provide sufficient justification for the IV strategy discussed next.

6.2 Instrumental Variables

IV offers a potential solution to many of the aforementioned measurement, selection, and identification issues. IV with a continuous instrument identifies a weighted average of the local average treatment effect (LATE), subject to independence, exclusion, relevance, and monotonicity assumptions discussed further below.[37] The intuition underlying this identification strategy is that plausibly exogenous variation in extreme daily temperatures measured at the municipality level, which result in household-level catastrophic crop losses in otherwise (conditionally) similar communities, facilitates comparison of the migration and local labor decisions in households that do not suffer a direct shock.

In particular, the identifying assumption is that households that did not experience crop losses in low-shock communities are similar to households that did not experience crop losses in high-shock communities. In other word, this analysis relies on the idea that prior to the onset of heat-induced crop losses, households that do not experience catastrophic crop losses are similar across communities. The notion that households that do experience heat-induced crop losses are also similar across these communities is also implicit in the identifying assumption. In order to assess these assumptions, I estimate the difference in means across communities (difference in differences) for a set of variables that describe household endowments and vulnerability to climate

[37] As demonstrated by Imbens and Angrist (1994), the LATE is identified in the context of a binary instrument in a linear model subject to relevance, exclusion and monotonicity assumptions. IV estimation with a continuous instrument identifies a weighted average of LATEs from all possible pairs of values of the instrument – the continuous average treatment effect (C-LATE) – but does not map directly to an estimand with a well-known definition like the LATE or lesser known estimands like the marginal treatment effect (MTE). Work by Carneiro, Lokshin, and Umapathi (2017) and Cornelissen at al. (2016) illustrate that the C-LATE is also a weighted average of MTEs. They demonstrate that the C-LATE is closest to an average treatment effect (ATE) using two empirical examples. For more information about the relationship between LATE, C-LATE and MTE see Heckman and Vytlacil (2007) as well as Cornelissen et al. (2016).

shocks. I classify communities as being low shock if less than 10 percent of households experienced a crop loss, while those above 10 percent qualify as high-shock communities.[38]

Table 3 presents the results of this exercise, which generally confirm the similarity of households across low- and high-shock communities. Columns 5 and 6, which present the difference in means and associated standard errors, are of most interest. Although the vast majority of differences are statistically insignificant, two exceptions standout. Irrigation is considerably more common in the municipalities in low crop loss communities (see column 2). Private land ownership is less common for these households, relative to households in their communities that did experience a crop loss (see column 1). This indicates that households who do not experience crop losses in low shock communities (column 2) may be more protected from climate shocks than their counterparts who experience crop losses in high shock communities (column 4).

The discrepancy in irrigation is confirmed by taking the single difference between columns 2 and 4, which suggests that one of the reasons why households did not experience crop losses in low shock communities (column 2) is due to their 22 percent advantage in irrigation, relative to households that did not experience crop losses in high shock communities. This indicates that some communities have already adapted agricultural production to risker conditions, though it is unclear if this is due to historically riskier weather or climate change. Given the general lack of observed adaptation to climate change in the literature, it is plausible that irrigation is primarily due to historically riskier conditions. In either case, I control for municipality-level irrigation and household-level private land ownership, along with all the other variables presented in Table 3, in an effort to account for any observable differences between households and the areas in which they reside. The potential remaining bias associated with this type of selection is discussed in more detail below.

[Table 3]

Consider the following system of equations, where the first-stage equation (5) quantifies the relationship between extreme heat events measured at the municipality level ($\mathbb{T}_{m02}$) and the proportion of neighbors' crop shocks in a community ($\mathbb{A}_{c02}$). The second-stage equation (6)

[38] The cutoff of 10 percent is based on a natural break in the distribution (see Figure A3 in the Appendix).

characterizes the relationship between the extent of neighbors' crop shocks in a community ($\mathbb{A}_{\mathrm{c02}}$) and individual labor decisions ($\mathbb{Y}_{\mathrm{it}}$) as a function of extreme heat ($\mathbb{T}_{\mathrm{m02}}$). This IV framework is just identified as the number of endogenous regressors ($\mathbb{A}_{\mathrm{c02}}$) are equal to the number of instruments ($\mathbb{T}_{\mathrm{m02}}$). The following system of equations (5) and (6) is most commonly solved via two-stage least squares (2SLS):[39]

$$\mathbb{A}_{c02} = \theta \mathbb{T}_{m02} + \boldsymbol{X}_{ihcm02}{}'\boldsymbol{\sigma} + \lambda_s + u_{ihcms02} \ , \quad (5)$$

$$\mathbb{Y}_{ihcmst} = \beta \widetilde{\mathbb{A}}_{c02} + \boldsymbol{X}_{ihcm02}{}'\boldsymbol{\pi} + \lambda_s + v_{ihcmst} \ .^{40} \quad (6)$$

The identifying variation for this empirical strategy is the plausibly exogenous variation in extreme daily temperatures incorporated at the municipality level ($\mathbb{T}_{\mathrm{m02}}$). The state fixed effects (λ_s) introduced above ensure that the identifying variation is strictly sourced from deviations in daily extreme, high temperature realizations relative to average extreme heat realizations in each state. I also control for a vector of individual, household, community, and municipality variables represented by $\boldsymbol{X}_{ihcm02}$ to control for a set of observable variables that may shape the likelihood of experiencing a crop loss and the probability of migration and local labor allocations. Though not exclusively so, the probability of experiencing a catastrophic crop loss is a function of factors including household land size and type, as well as municipality irrigation and percent planted with maize or coffee. Meanwhile, migration and local labor decisions are shaped by age, sex, education, household size, previous migration experience, land size and type, as well as municipality economic diversity, marginalization, and migration intensity. Community-level controls ensure the comparability of communities above and beyond the plausibly exogenous nature of the temperature instrument; this is important given that the proportion of neighbors experiencing a crop shock is measured at the community level.

In this IV framework it is the daily realizations of extreme heat measured at the municipality level that induce the crop shocks experienced by households in similar communities. Potential selection in types of communities is addressed by the plausibly exogenous nature of the temperature instrument and community-level control variables. Critically, possible selection for

[39] In practice, this IV-2SLS setup is estimated as possibly inefficient generalized method of moments (IGMM) with an arbitrary weight matrix.
[40] Unbiased and consistent estimation of IV-2SLS requires that the same set of controls ($\boldsymbol{X}_{hcm02}$ and λ_s) be specified in each equation (Wooldridge, 2002).

observations that did not experience crop shocks across communities does not appear to be substantial (Table 2). That said, potential remaining selection at the household-level associated with unaccounted-for vulnerability to crop losses may persist. This type of selection likely results in a conservative estimate or underestimate of β, the coefficient of interest measuring the effect of observing crop losses on labor allocation decisions. This is because households that do not experience heat-induced crop losses are potentially less vulnerable to crop shocks to begin with. As a result, this strategy results in the estimation of a lower bound for β subject to satisfying the independence, exclusion, relevance, and monotonicity conditions detailed further below.

In particular, β represents the individual labor response to learning from the heat-induced crop losses of others during 2000–2002, which evaluates the hypotheses relating to ex ante responses, adaptation, and gender heterogeneity (*H1*, *H2*, and *H3*). Learning from others may be a direct result of learning about the crop losses of neighbors, learning about the resulting change in the demand for labor in the community (i.e., general equilibrium changes in labor explored by Jessoe, Manning, and Taylor, 2018), or a mix. More immediate labor responses in 2002 and 2003 are most likely be indicative of learning from the crop losses of others, as opposed to lagged or sustained allocations in 2004 and 2005. This is not only because the salience of the crop loss signal is strongest immediately after heat-induced crop shocks, but also because potential general equilibrium labor shifts become increasingly plausible and influential over time as individual labor decisions accumulate and feedback effects manifest. That said, descriptive evidence suggests that the relative proportion of labor allocated across employment categories remains relatively stable from 2002 to 2005 despite the overall reduction in reported employment.

Irrespective of the specific type of learning from others mechanisms involved, β may represent adaptation in cases where individuals shift labor out of activities that are more vulnerable to extreme heat ($\beta < 0$), such as agricultural work or self-employment, into activities that are potentially less susceptible to the crop loss risks associated with extreme heat, such as nonagricultural work, wage employment, and migration out of the community ($\beta > 0$). Nonagricultural work and wage employment represent activities that are less vulnerable to climate change to the extent that agricultural crop shocks do not impact them adversely. While these activities are not likely to be completely decoupled from crop outcomes in rural, agricultural communities, they are undoubtedly subject to lower levels of direct temperature risk than agricultural activities, especially agricultural self-employment. They also represent a local adaptation mechanism that does not necessarily incur large costs relative to the financing required to facilitate migration

Migration within Mexico or internationally (primarily to the United States) also represents activities that are less vulnerable to climate change as they provide (potentially lucrative) opportunities to diversify income risks within the household. Even in the case where a migrant's income remains dependent on agriculture at a new destination, this still diversifies the household's income-generating portfolio for two reasons. Agricultural outcomes at the new destination may be less vulnerable to climate than in the origin community. Additionally, the risks associated with climate change in the origin community are unlikely to be highly correlated with risks at the different location. Relative to local labor adjustments, migration is a costlier activity that requires a larger up-front investment, especially international migration, as well as access to migration networks with information about opportunities outside of the community. We might expect to find more ex ante adaptation in terms of local labor outcomes for these reasons. That said, the opposite may be true if local labor markets in rural, agricultural communities cannot absorb adjustments in labor allocations.

The β coefficient is most likely to provide (conservative) evidence of ex ante adaptation in the case that individuals who did not experience catastrophic crop losses observe the heat-induced crop shocks of others and reallocate labor in the period thereafter to mitigate the increased probability of future heat-induced crop shocks.[41] The longer it takes to observe a labor response, the less likely that labor reallocations are strictly due to learning from the crop losses of others and the less plausibly that they can be characterized as ex ante. To the extent that migration is less responsive to potential general equilibrium shifts in labor supply or demand, migration decisions may provide a better test case for ex ante responses than local labor outcomes. In either case, in Subsection 7.7 I show that general equilibrium labor shifts are not large and are, therefore, not likely to be influential.

[41] The possibility remains that β also represents an ex post dynamic relating to less severe crop loss. While this cannot be completely ruled out due to the lack of crop-specific information in the MxFLS, the direction of ex post effects and responses is unclear. Moderate levels of heat-induced crop loss may motivate labor reallocation, but they may not if households interpret their crop outcomes as evidence of resilience in their productive endowments. This is another justification for defining ex ante responses with respect to the increased probability of future heat-induced catastrophic crop shocks in the context of this study. All that said, if moderate crop loss due to temperature is an important determinant of migration and local labor decisions, this should be evident in the mechanism tests I conduct later in this study.

The validity of the IV strategy used to explore the ex ante adaptation hypothesis rests on four assumptions (**A2**–**A5**, below). In the interest of simplicity, I express them without subscripts whenever feasible.

A2. Independence: $\mathbb{T} \perp \mathbb{Y}, \mathbb{A}$.

A3. Exclusion: $Cov[T, v] \neq 0$.[42]

A4. Relevance: $Cov[\mathbb{T}, \mathbb{A}] \neq 0$.[43]

A5. Monotonicity: $\mathbb{A}_h(\mathbb{T} > 0) - \mathbb{A}_h(\mathbb{T} = 0) \geq 0 \;\; \forall h$.[44]

Independence (**A2**) requires that daily temperatures within states be as good as randomly assigned conditional on all controls. To be specific, this requires that heat shocks ne distributed as if they are random across communities, which is plausible conditional on municipal, community and state controls. This is a relatively inoffensive assumption, as daily variation in weather conditions like temperature are commonly considered to be exogenous. Dell, Jones and Olken (2014) as well as Carleton and Hsiang (2016) review the justification for treating a variety of environmental conditions as being plausibly exogenous and associated empirical strategies.

The exclusion restriction (**A3**) requires that the extreme heat events strictly influence migration and local labor decisions through agricultural outcomes. Mechanically, this requires that extreme heat and the error term in the second-stage equation (6) be uncorrelated. Put differently, this assumption stipulates that daily realizations of extreme heat within a state be uncorrelated with the determinants of migration and local labor decisions. Ultimately, this is the most difficult assumption to satisfy. It is, for instance, not out of the question that temperature may influence labor decisions through its impact on moderate crop losses in the households, productivity, violence, crime, or health outcomes. To complicate matters, this condition cannot be truly verified, as it is fundamentally a conceptual matter. That said, recent innovations by Acharya, Blackwell and Sen (2016) in identifying direct and indirect effects provide a method that may be applied in an IV framework to assess the plausibility of alternative explanations and characterize the

[42] The exclusion restriction can also be summarized as $\mathbb{Y}(\mathbb{T}, \mathbb{A}) = \mathbb{Y}(\mathbb{A})$ or $\mathbb{Y}(\mathbb{T} > 0, \mathbb{A}) = \mathbb{Y}(\mathbb{T} = 0, \mathbb{A})$.
[43] The relevance condition can also be expressed as $\mathrm{E}[\mathbb{T}, \mathbb{A}] \neq 0$ or $\mathrm{E}[(\mathbb{A} > 0) - (\mathbb{A} = 0)] \neq 0$.
[44] In the context of equation (5), monotonicity implies that $\theta \geq 0$ for all households.

likelihood of satisfying the exclusion restriction. Additional details regarding this technique are offered in the following subsection.

Relevance (**A4**) of the first-stage equation (5) requires that extreme heat and agricultural crop outcomes be correlated. In other words, extreme heat must be a strong predictor of agricultural crop losses. A statistically significant θ coefficient (in the expected direction, i.e., $\theta > 0$) in equation (5) is indicative of a relevant first stage. Furthermore, a number of diagnostic hypothesis tests can be implemented to assess the strength of an instrument. This is crucial, as weak instruments can substantially bias estimates (Nelson and Startz, 1990; Stock and Yogo, 2005). Cragg and Donald (1993) provide the most commonly used weak instrument test. An advantageous feature of the Cragg-Donald diagnostic is that it can be evaluated relative to the critical values derived by Stock and Yogo (2005).[45] However, the Cragg-Donald approach is not robust to heteroskedasticity. As a result, the Cragg-Donald diagnostic may overstate the strength of instruments in data that is not independently and identically distributed (iid). Building on the aforementioned methods, Montiel Olea and Pflueger (Montiel Olea and Pflueger, 2013) develop a weak instrument test and the associated maximal relative bias critical values that are robust to heteroskedasticity. They suggest a critical value of 23 as an asymptotically valid rule-of-thumb for assessing the strength of an instrument. An *F*-statistic value of at least 23 is indicative of a strong instrument with a worst-case relative bias of 5 percent or less.[46]

Monotonicity (**A5**) requires that extreme heat events weakly influence agricultural crop outcomes in the same direction for all households. Extreme heat deviations must either have no or an adverse influence on crops outcomes in the data; in other words, there should be no defiers. This is not a particularly troublesome assumption given the evidence base on how exposure to extreme heat reduces yields and potentially leads to crop shocks (Schlenker, Hanemann, and

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[45] Cragg-Donald diagnostics are conventionally benchmarked relative to the Staiger-Stock (1997) rule-of-thumb of 10. For instance, a test statistic of 10 or above provides evidence of a strong instrument with a worst-case relative bias of 10 percent or less. Additionally, Kleibergen and Paap (2006) provide a frequently used diagnostic test of underidentification that is robust to heteroskedasticity. It assesses whether the weakest correlation between an instrument and an endogenous regressor (net of exogenous controls and cross-correlations) contributes sufficient independent variation.

[46] IV estimation via limited information maximum likelihood (LIML) offers an alternative to standard 2SLS and GMM approaches in the context of weak instruments. This is because LIML provides estimates that can be less biased in small samples. However, a just identified system of equations with one endogenous regressor and one instrument is approximately unbiased (Angrist and Pischke, 2008) so there is not much to learn from LIML.

Fisher, 2005; Schlenker and Roberts 2009; Feng, Krueger, and Oppenheimer, 2010; Welch et al., 2010; Schlenker and Lobell, 2010),[47] especially for staple crops like corn that are common in Mexico.

To the extent that these four assumptions are satisfied and that the aforementioned sources of selection, omitted variable, and measurement error are accounted for, equations (5) and (6) may identify a lower-bound estimate of how ex ante migration and local labor adapt to the increased likelihood of future heat-induced crop shocks. Beyond the perennially difficult to satisfy exclusion restriction (**A3**), omitted variables such as individual-level ability and motivation may bias results if these unobserved traits are not adequately reflected in individual- and household-level controls such as years of education or previous labor experiences.

The lack of controls for time trends represents one potentially important omission. Such controls are, unfortunately, not feasible because of the lack of observed variation in extreme heat and reported catastrophic crop losses during the 2003–2005 exposure window, which results in a weak first stage.[48] That said, other studies of migration and local labor in Mexico discussed below suggest that the lack of controls for time trends in this context may not be problematic. This is because increasing migration trends from Mexico tapered off and began to decline following the peak period of "the great emigration" around the turn of the century (Hanson and Mcintosh, 2010; Villareal, 2015; Riosmena, Nawrotzki, and Hunter, 2018). This suggests that migration trends were either stable or falling during the study period. Furthermore, local labor employment in rural areas, especially agricultural employment, has been shown to be trending downward (Charlton and Taylor, 2016; Jessoe, Manning, and Taylor, 2018). As such, increases in migration or increases in local labor responses to the heat-induced crop losses of others are not likely to be driven by unaccounted-for time trends.

Inference is based on an error structure that is robust to heteroskedasticity and is clustered at the municipality level, which is the level of temperature exposure. I cluster at the municipality level based on the idea that intramunicipality correlation is stronger than intermunicipality correlation, whether it be due to prevailing conditions, sampling involved in data collection, or the

[47] Also see Olmstead and Rhode (2011), Schlenker, Roberts, and Lobell (2013), Auffhammer and Schlenker (2014), and Annan and Schlenker (2015).

[48] Only 40 households report catastrophic crop losses over the 2003-2005 period in rural communities While this may not be as problematic for reduced form estimation, it is invalidating for IV.

exposure to temperature. Clustered errors that are robust to heteroskedasticity generate sufficiently conservative standard errors in this context (Abadie et al., 2017).[49]

6.3 Alternative Explanations

I explore the possibility of alternative explanations in two ways. First, I show explicitly that the relative proportion of individuals working in each employment category remains similar over time to rule out general equilibrium dynamics. Second, I test whether crop losses are the mechanism through which extreme heat shapes migration and local labor decisions. I do this by applying a method developed by Acharya, Blackwell, and Sen (2016) to assess if variation in extreme heat events, net of the influence of crop losses, remains correlated with labor outcomes. I do this for two reasons. It allows me to test alternative mechanisms running from extreme heat to migration and local labor outcomes, such as moderate crop losses within the household, drops in productivity, or increased violence and crime. Second, this empirical exercise serves as a falsification test regarding the plausibility of satisfying the exclusion restriction. In other word, this method can provide corroborating evidence regarding the likelihood of satisfying the (ultimately conceptual) exclusion restriction (**A3**).

Drawing on methods from biostatistics, Acharya, Blackwell, and Sen (2016) show how to estimate the average controlled direct effect (ACDE) subject to a sequential independence assumption described below. The ACDE can be interpreted as an unbiased estimate of the effect of an exposure when a mediating mechanism is fixed at a particular level.[50] Recovering the ACDE can be helpful in (i) assessing whether a particular mechanism ($\mathbb{A}_{c02}$) is the mediator between an exposure ($\mathbb{T}_{m02}$) and an outcome ($\mathbb{Y}_{it}$), as well as (ii) detecting whether correlation remains between the exposure ($\mathbb{T}_{m02}$) and the outcome ($\widetilde{\mathbb{Y}}_{it}$) once the mediator has been accounted for. In other words, the ACDE makes it possible to confirm or rule out competing explanations, potentially lending support for one particular mechanism. Estimating the ACDE involves the following sequence of equations:

[49] It should be noted may that recent work by Young (2018) raises questions regarding the biases and power associated with IV estimates in the absence of an iid data generating process, suggesting that the computation of standard errors and weak instrument tests may need to be reconsidered in the interests of reliable inference for IV.

[50] An average treatment effect (ATE) can be decomposed into the average controlled direct effect (ACDE), the average natural indirect effect (ANIE) and the potential interaction of these two components (I) in the following way: $ATE = ACDE + ANIE + I$.

$$\mathbb{Y}_{ihcmst} = \delta\mathbb{A}_{c02} + \rho\mathbb{T}_{m02} + \boldsymbol{X}_{ihcm02}{}'\boldsymbol{\zeta} + \lambda_s + w_{ihcmst} \ , \tag{7}$$

$$\text{compute } \widetilde{\mathbb{Y}}_{ihcmst} = \mathbb{Y}_{ihcmst} - \hat{\delta}\mathbb{A}_{c02} \ , \tag{8}$$

$$\widetilde{\mathbb{Y}}_{ihcmst} = \kappa\mathbb{T}_{m02} + \boldsymbol{W}_{ihm00}{}'\boldsymbol{\varphi} + \lambda_s + \eta_{ihcmst} \ , \tag{9}$$

$\boldsymbol{W}_{ihm00}{}'\boldsymbol{\varphi}$ is the vector of pretreatment controls.

The vector κ in equation (9) is the coefficient of interest that represents the ACDE associated with exposure to extreme heat. It measures the influence of high temperatures on labor decisions, net of the effect that daily heat realizations have on labor outcomes through agricultural crop outcomes. When $\kappa = 0$, the null ACDE suggests that there is no remaining relationship from extreme temperatures to labor decisions. Given the inclusion of predicted dependent variable in equation (9), this routine requires bootstrapping to facilitate valid inference (Cameron and Trivedi, 2009). In particular, I bootstrap by resampling observations with replacement 1,000 times by municipality to calculate normal-approximated confidence intervals.

The identifying assumption for the ACDE is the following:

A6. Sequential Unconfoundedness:

$\{\mathbb{Y}(\mathbb{T},\mathbb{A}), \mathbb{A}(\mathbb{T})\} \perp \mathbb{T}|\boldsymbol{W}$,

$\mathbb{Y}(\mathbb{T},\mathbb{A}) \perp \mathbb{A}|\{\mathbb{T}, \boldsymbol{W}, \boldsymbol{P}\}$,

where $\boldsymbol{W}$ *represents pre-treatment &* $\boldsymbol{P}$ *represents post-treatment controls,*

$\forall\ values\ of\ exposure\ \mathbb{T}, mediator\ \mathbb{A}, as\ well\ as\ controls\ \boldsymbol{W}\&\ \boldsymbol{P}.$

Sequential unconfoundedness (**A6**) is essentially a condition requiring that any selection inherent to the channel from extreme temperatures through agricultural crop losses to labor outcomes be confined to observable characteristics, as opposed to selection on unobservables. This assumption may be satisfied to the extent that the IV strategy overcomes the aforementioned potential selection challenges. The first expression in **A6** requires that there be no omitted variables in the relationship between extreme heat ($\mathbb{T}$) and labor decisions ($\mathbb{Y}$), conditional on pretreatment controls ($\boldsymbol{W}$). Given the plausibly exogenous nature of daily temperature deviations, this condition may be met.

The second expression requires that there be no omitted variables in the relationship between catastrophic crop losses ($\mathbb{A}$) and labor outcomes ($\mathbb{Y}$), conditional on extreme heat ($\mathbb{T}$), pretreatment controls ($\boldsymbol{W}$), and posttreatment controls ($\boldsymbol{P}$).[51] The latter requirement is more difficult to satisfy in this context. The fact that the identifying variation is rooted in exogenous daily temperature realizations suggests that this condition may also be met on the community level. Household-level selection in vulnerability to crop shocks, on the other hand, likely remains an issue. This represents an omitted variable shaping (agricultural participation and) vulnerability to crop shocks. However, this type of selection would likely result in the underestimation of the agricultural mechanism in this context, thereby, making it more likely to find evidence of an alternative direct or indirect mechanism.

To summarize, estimating the ACDE provides a method for explicitly testing the relevance of alternative explanations, such as moderate crop losses within the household, drops in productivity, deteriorating health, or increased violence and crime, thereby also characterizing the likelihood of satisfying the exclusion restriction. Although the ACDE can not fully test the ultimately conceptual exclusion restriction, it does offer a useful falsification test. Put differently, the ACDE provides an empirical, diagnostic exercise that can provide evidence of a pattern of variation that may substantiates the salience of alternative mechanisms, which would be inconsistent with the exclusion assumption. To my knowledge, this method has yet to be used in the context of an IV framework to characterize the plausibility of meeting the exclusion restriction.

6.4 Robustness

I also assess the robustness of this estimation strategy in the following ways. I test whether results are consistent to the exclusion of households that experienced catastrophic crop losses from 2003 to 2005, which may result in a spurious association between crop shocks and migration flows after 2002 or local labor outcomes in 2005. In a similar fashion, I test if attrition of individuals between survey rounds drives results. I do this by estimating the relationship between catastrophic

[51] Pretreatment controls ($\boldsymbol{W}$) strictly include control variables that were measured prior to 2000, are invariant to temperature exposures and crop shocks, or are relatively fixed. This includes previous household migration experience that is measured up until 1999; and municipality characteristics in 2002 including the percentage of land irrigated, the percentage of planted with maize or coffee, the population of the municipality, and measures of economic diversity, marginalization, and migration intensity, as well as individual age and sex. Posttreatment controls ($\boldsymbol{P}$), which are also referred to as intermediate confounders, include all remaining controls.

crop losses and migration and local labor outcomes strictly for individuals who are present in both survey rounds. Furthermore, I assess the extent to which the strength of the learning signal in rural, agricultural communities shapes labor decisions associated with the climate-induced crop shocks of neighbors. I do this by varying the restriction that 40 percent of households in a community own or use land. This exercise not only assesses the strength of the learning from others mechanism, but also serves to test the sensitivity of results relative to community engagement in agriculture.

7. Findings

This section describes how individuals respond to the heat-induced crop shocks they observe in their communities by adjusting their participation in migration and local labor. In this risk-theoretic context, changes in labor decisions may be associated with learning about the crop losses of neighbors, the subsequent changes in the local labor market, or a mix. Individual migration flows are defined as any domestic migration within Mexico (outside of the origin community) from 2002 to 2005 and any international migration during the same period. Migration and local labor decisions are studied as a function of the heat-induced catastrophic crop losses that individuals observe among their neighbors in rural, agricultural communities. Local labor is defined as agricultural self-employment, agricultural wage employment, nonagricultural self-employment, and nonagricultural wage employment in 2002 and 2005. Evidence of ex ante adaptation is most likely to be found if individuals reallocate labor in the period immediately following the crop losses of others in a manner that may mitigate the increased probability of future climate-induced crop losses.

I begin by describing the effect that extreme heat has on the proportion of neighbors in a community experiencing catastrophic crop losses (first-stage results). Next, I present findings on initial migration and local labor decisions from 2002 to 2003 for the full analytical sample, as well as separately for females and males. This includes 2002–2003 migration decisions and 2002 labor outcomes for the same groups. I then consider findings on migration and local labor decisions in the subsequent period from 2004 to 2005, which may be more reflective of sustained impacts. This includes migration outcomes in 2004–2005 and labor decisions in 2005. I emphasize domestic migration for the year-to-year migration outcomes due to the aforementioned data limitations associated with the year-to-year international migration variables. Next, I present aggregated migration estimates for the full flow of migrants from 2002 to 2005. I then explore the labor, land,

and asset profile of households participating in migration and local labor activities. Finally, I provide a brief summary and deeper interpretation of the results. The sensitivity of these findings, including a mechanism test, a comparison of the ex ante results relative to ex post estimates, and an assessment of the learning from others signal, are reported in the next section.

7.1 Community Crop Losses

Table 4 demonstrates that extreme heat, represented at the municipality level from 2000 to 2002 as (i) the total deviation spell, (ii) the total HDD 30 °C spell, or iii) their interaction, has a positive, statistically significant effect on the proportion of neighboring households experiencing a crop shock in rural, agricultural communities during the same period (full results for all first-stage regressions are available in Tables A2–A9 of the Appendix). In columns 1 and 4, we see that experiencing 10 more consecutive days of extreme heat, relative to the historical norm, during a maximal heat spell increases the proportion of neighbors in a community experiencing a crop shock by approximately 6 to 7 percentage points, which is roughly equivalent to a 78 to 87 percent increase relative to the mean of 8.3 percentage points.[52] In columns 2 and 5 we see that experiencing 10 additional consecutive days of extreme heat above 30 °C during a maximal heat spell increases the proportion of neighbors in a community suffering from a crop shock by approximately 2.5 percentage points, which is roughly a 30 to 31 percent increase. The difference between these coefficients is not surprising given that, by construction, the total temperature deviations measure is more reflective of abnormal temperature events within a municipality relative to a historical benchmark.

[Table 4]

First-stage *F*-statistics ranging from 28 to 73 for deviations and 49 to 75 for HDD 30 °C indicate that both instruments are strong, surpassing the specific critical value thresholds for each

[52] Estimates of the effect of extreme heat deviations on the proportion of neighboring households experiencing crop shocks are approximate because OLS with a dependent variable that is a proportion may result in biased estimates. This is because OLS does not appropriately account for the nonlinearities in the distribution of a proportion, which can result in highly nonnormal regression errors. That said, OLS with a dependent variable structured as a proportion remains adequate for partialing variation through the first stage of an IV approach, so long as coefficients are interpreted with caution.

specification. These F-statistics are also well above the conventional rule-of-thumb of 10 (Stock and Yogo, 2005; Kleibergen and Paap, 2006), which is not robust to heteroskedasticity, and the more conservative, heteroskedastic-robust rule-of-thumb of 23 (Montiel Olea and Pflueger, 2013). This constitutes fulfilling the aforementioned relevance assumption (**A3**). In the interests of further strengthening the instrument to facilitate gender-disaggregated analysis, given the substantial difference in migration opportunities and labor markets that women and men face, I combine these two variables by interacting them to create the extreme heat total spell interaction for 2000–2002:

$$Tot\ Spell\ Interaction = Tot\ Deviation\ Spell \times Tot\ HDD\ 30℃\ Spell\ . \quad (7)$$

While the specific interpretation of the resulting coefficient (0.052 and 0.055) in columns 3 and 6 is less straightforward, the results of the interacted instrument provide consistent evidence of the positive effect that extreme heat deviations have on catastrophic crop losses. The total spell interaction is estimated far more precisely; as a result, the associated F-statistics of the interacted instrument range from 73 to 114. This suggests that the total spell interaction is a considerably stronger instrument, which is advantageous in routing exogenous variation from the first to the second stage of the IV framework for the full and gender-desegregated samples. Interacting the deviation and HDD 30 ℃ variables also has the added benefit of upweighting cases where both the deviation and HDD thresholds are crossed. As a result, the interaction places more weight on the cases where the thresholds that may be associated with changing behavioral expectations (deviations) agronomic outcomes (HDD 30 ℃) are surpassed. I rely on the total spell interaction as the preferred instrument moving forward.

7.2 Initial Migration and Local Labor Allocations

I proceed by presenting second-stage IV estimates of how the proportion of surrounding households in a community experiencing temperature-induced crop losses influences migration and local labor decisions. I focus inference on IV instead of OLS results because of the potential for unaccounted-for biases in the latter approach. In fact, it is difficult to learn much from the OLS estimates because they are systematically attenuated (see Tables A10–A21 in the Appendix). I first discuss IV results regarding initial migration and local labor decisions for the full sample of individuals in households that did not experience a catastrophic crop loss from 2000 to 2002. This includes international and domestic migration from 2002 to 2003, as well as agricultural self-employment, agricultural wage-employment, nonagricultural self-employment, and nonagricultural wage employment in 2002. I examine results for the full sample of households who did not experience catastrophic crop losses of observations and then show separate estimates for females and males.

Table 5 presents results for international and domestic migration decisions from 2002 to 2003 (full results are available in Table A10 of the Appendix). The coefficient of interest in Table 5 describes the effect of observing a 10 percentage point increase in the proportion of neighboring households experiencing heat-induced crop losses on migration decisions. A 10 percentage point increase is essentially equivalent to a one standard deviation increase (0.103) and is much easier to interpret than a 100 percentage point increase, which is the default interpretation of a regressor measures as a proportion. In column 1 of panel A we observe a 0.8 percentage point increase in the probability of international migration, and in column 2 we see a 2.6 percentage point increase in the probability of domestic migration. Despite being an underestimate due to the data limitations associated with the year by year measures, the domestic migration coefficient represents a proportionally large impact relative to the mean: a nearly 87 percent increase in the probability of domestic migration.

[Table 5]

Gender-disaggregated results, presented in panels B and C, shed light on these effects for women and men. In column 1 of panel B we observe a 1.5 percentage point increase in international migration, and in column 2 a 3.6 percentage point increase in domestic migration for females. In contrast, in panel C, for males we only see a 1.3 percentage point increase in domestic migration in column 2. These findings suggest that while both females and males contribute to ex ante domestic migration, the aggregate response may be driven by women. These migration results are suggestive of ex ante adaptation to climate change, though I refrain from deeper interpretation of the findings until the full pattern of estimates has been considered.[53]

[53] The international migration results should be interpreted with caution given that they capture only a small fraction of the international migrants reflected in the 2002–2005 variable.

Table 6 presents results for agricultural self-employment, agricultural wage employment, nonagricultural self-employment, and nonagricultural wage employment outcomes in 2002 for nonmigrant individuals who reside in the community (full results are available in Table A13 of the Appendix). The coefficient of interest describes the effect of observing a 10 percentage point increase in the proportion of neighboring households experiencing heat-induced crop losses on local labor decisions. In column 1 of panel A we observe an 8.5 percentage point increase in the probability of agricultural self-employment, and in column 2 we see a 7.1 percentage point decrease in the probability of nonagricultural wage employment. These represent proportionally large impacts: a 53 percent increase in agricultural self-employment and a 60 percent decrease in agricultural wage work. Estimates in columns 3 and 4 suggest that, on average, there is no effect on either category of nonagricultural employment.

[Table 6]

Gender-disaggregated results, presented in panels B and C, shed light on these effects for women and men. In column 2 of panel B we observe a 3.8 percentage point decrease in agricultural wage employment for females. In contrast, in panel C, for males we see a 15.6 percentage point increase in agricultural self-employment in column 1, a 9.7 percentage point decrease in agricultural wage work in column 2, and a 3.6 percentage point increase in nonagricultural employment in column 3. These findings suggest that changes for males drive the shift toward agricultural self-employment and away from agricultural wage employment. Unlike the migration findings presented above, these local labor findings are not as clearly indicative of ex ante responses or adaptation to climate change. This is because local labor reallocations are more immediately sensitive to changes in the demand and value of labor in the community and because I do not consider reallocating labor into a risk intensifying activity as adaptation to climate change.

7.3 Sustained Migration and Local Labor Allocations

Table 7 presents results for the sustained effect of learning from the crop losses of others during 2000–2002 on international and domestic migration outcomes during 2004–2005 (full results are available in Table A10 of the Appendix).[54] These estimates are less likely to provide clear evidence of ex ante adaptation due to the increased potential for unobserved confounders from the 2003–2005 window, including the influence of potential general equilibrium shifts in the local labor market. Although descriptive evidence is not suggestive of substantial changes in the structure of the labor market, this cannot be entirely ruled out. In either case, it is useful to understand the extent to which earlier migration and local labor responses persist.

In column 1 of panel A we observe a 1 percentage point decrease in the probability of international migration, and in column 2 of panel B we observe a 1.7 percentage point decrease in domestic migration for females. These estimates indicate that the vast majority of additional migration associated with the catastrophic crop losses of others took place during 2002–2003. These migration estimates for 2004–2005 suggest that the observed increases in migration during 2002–2003 are not sustained. The initial ex ante migration adaptation observed for 2002–2003 is likely only temporary, which may represent short-term or seasonal risk-mitigating behavior (Dustmann and Görlach 2016).[55]

[Table 7]

Table 8 presents results for local labor decisions in 2005 (full results are available in Table A16 of the Appendix).[56] Similar to labor outcomes in 2002, we see a 5.4 percentage point increase in agricultural self-employment in column 1 of panel A, but no other impact is discernable in the full sample for 2005. However, gender-disaggregated results in panels B and C illustrate a more nuanced pattern. For females in panel B, I find an increase in agricultural self-employment of 1 percentage point in column 1, a decrease in agricultural wage work of 3.3 percentage points in column 2, and a decrease of 5.6 percentage points in nonagricultural self-employment in column 3. For males in panel C, I find an increase in agricultural self-employment of 11 percentage points in column 1 and no other effect. The sustained increases in agricultural self-employment in 2005 are consistent with those in 2002 and, not surprisingly, of a smaller magnitude. The increase in the full sample falls from 8.5 to 5.4 percentage points over the period, while the increase for females

[54] These specifications are not sensitive to the inclusion or exclusion of 2002 labor outcomes.

[55] Again, it is not clear how much stock should be put into the lack of significant results from 2004–2005 due to the measurement error associated with the year-to-year international migration variables.

[56] These specifications are not sensitive to the inclusion or exclusion of 2002–2003 migration outcomes.

drops from 3.9 to 1 percentage point, and the increase for males falls from 15.6 to 11 percentage points. In sum, we observe that the much of the increase in agricultural self-employment is sustained and that it is primarily concentrated in the local labor outcomes of males.

[Table 8]

7.4 Aggregate Migration Flow

Table 9 presents results for the full flow of international and domestic migrants from 2002 to 2005 (full results are available in Table A19 of the Appendix). As described above, these flows are defined as any migration journey by an individual from 2002 to the time of the second round of MxFLS data collection in 2005, including migrant tracking efforts. For the reasons discussed earlier, these variables likely represent more comprehensive and accurate measures of migration during the study period. In columns 2 and 3 of panel A we observe a 3 to 4 percentage point increase in the probability of domestic migration, but no effect for international migration. This represents a large proportional impact: a 60 to 66 percent increase in the probability of domestic migration. The reasonably tight range of the lower- and upper-bound estimates provides confidence regarding the validity of the domestic migration estimates.

Results in columns 2 and 3 of panel B suggest that this increase in domestic migration may be relatively similar for females and males, though the coefficients for females are more precisely estimated. The lack of precision for the male results makes it difficult to conclude whether the response for men is similar or if this result is due to chance. Hence, I primarily focus on the coefficient for women. We observe an increase in domestic migration of 2.9 to 3.1 percentage points for females, while we see a 3 percentage point increase in international migration in column 1 and a 4.4 percentage point increase in the upper bound of domestic migration in column 3 for males. The lower-bound estimate of 2.7 percentage points for males is similar to the magnitude for females, but it is not statistically significant at conventional levels. Gender-differentiated domestic migration responses may be similar or slightly more concentrated for women, while international migration responses may be a male phenomenon. This overall pattern is relatively intuitive considering that international migration from Mexico has historically been dominated by males, while domestic migration is common for both genders (as demonstrated in Table 1).

[Table 9]

To briefly recap the three sets of migration results, first we first observe that domestic migration increases associated with the crop losses of others primarily take place during 2002–2003, in the period that immediately follows observing the catastrophic crop losses. It appears more likely that initial domestic migration responses are driven by females rather than by males. Second, these effects are not sustained during 2004–2005. However, all of these findings likely represent lower bounds as a result of the way migration is measured for each year and the potential for household-level selection in vulnerability to shocks. Third, from 2002 to 2005 (when measurement issues are resolved) we observe a similar pattern of results relative to those from 2002 to 2003, especially with respect to increases in domestic migration among females. The 2002 to 2005 data suggest that there may have also been an increase in international and domestic migration among men, but the imprecise and inconsistent pattern of results preclude clear conclusions. Finally, the overall pattern of results is suggestive of both learning from the crop losses of others and ex ante adaptation to extreme heat in the short term. I discuss this in more detail at the end of this section.

7.5 Individual Migration Profiles

In this subsection I provide descriptive statistics to characterize migration destinations and persistence.[57] I do this separately for migrants from households that use or own land in communities where at least 40% of households engage with the land (i) that experienced catastrophic crop losses and (ii) from similar households that did not but observed those of their neighbors (the analytical sample) in Table 10. The migrants from households that experienced catastrophic crop losses are most acutely and adversely exposed to climate risk while migrants from non-shocked households are exposed but less affected by similar climate risk. I further disaggregate the analytical sample according to how widespread crop shocks were experienced in the communities from which migrants originated – low- versus high-shock communities, as described in sub-section 6.2.

[57] The MxFLS does not disclose migrant destinations to ensure the confidentiality of survey participants. This precludes a direct analysis of the correlation in extreme heat events between origin and destination locations in the style of Rosenzweig and Stark (1989) that could serve to explicitly substantiate risk diversification motives.

The patterns that emerge from this basic assessment inform our understanding of whether mobility patterns are consistent with spatial risk diversification. Looking across the four columns it is immediately apparent that the vast majority of migrants journey to settings where local climate risks will likely be uncorrelated with those in their origin communities – upwards of 62% of migrants relocate to a city, other state within Mexico or internationally.[58] It is also clear that migrants tend to engage in short-term migration – more than 75% of migrants report trips of more than a month but less than 12 months, which is consistent with Mexico's history of seasonal and circular migration.

[Table 10]

In particular, in column 1 I observe that migrants from shocked households are more likely to migrate to a city or internationally (along with the city, other state or international aggregate) relative to migrants from non-shocked households. The difference is only statistically significant for the city, other state or international aggregate measure, but this is not surprising given the relatively small sample size. While they are also more likely to engage in long-term migration, the proportion of shocked migrants is comparable to migrants from non-shocked households presented in column 2.[59] In contrast, migrants from non-shocked households, the focus of this study, are more likely to migrate to another state and to engage in short-term migration. Broadly speaking, the abovementioned descriptive statistics are suggestive of a pattern of migration that is consistent with spatial and sectoral (urban) diversification to climate risk.

Next, I present disaggregated descriptive statistics for migrants from households that were not shocked but observe low versus high intensities of catastrophic crop losses. What stands out is that migrants from high-shock communities (column 6) are more likely to migrate to another state, internationally (along with the city, other state or international aggregate), and over the long-term than migrants from low-shock communities (column 5). Additionally, the proportion of migrants from households that were not shocked but reside in high-shock communities is higher than for

[58] Information on the state within Mexico or international migration is available for both short-term and long-term migrants, but the sector (urban) can only be deduced for permanent migrants. As a result, this measure provides a conservative estimate of migrating to a city and urban settings.

[59] In the MxFLS, long-term migration is defined as a period of 12 or more months while short-term migration is a journey of at least one month but less than 12 months.

their counterparts, though none of the differences between high- and low-shock communities are statistically significant. In sum, I observe that migration behavior is generally consistent with spatial and sectoral diversification to climate risk not only for individuals from households that directly experienced catastrophic crop losses but also for individuals from households that do not experience crop losses themselves but observe a higher incidence of them in their communities.

7.6 Household Endowment Profiles

In order to gain a better understanding of labor allocations into migration and agricultural work in the context of heat-induced crop shocks, I present descriptive statistics for household land, labor, and asset endowments. I aggregate participation in an activity, such as domestic migration or agricultural self-employment, over time to characterize households with no participation in the activity from 2002 to 2005 relative to participation in the activity over the same period. Table 11 demonstrates that households that sent migrants during 2002–2005 tend to have a larger household size, a higher labor-to-land ratio, and fewer assets in 2002. This descriptive evidence suggests that labor availability is an important determinant of migration responses in the context of temperature-induced crop losses. On the other hand, lower asset values suggest that migration is not necessarily constrained by access to wealth or financing. Additionally, we see that households sending domestic migrants own or use less land in 2002 and are more likely to have previous migration experience. Although the statistical significance of differences is inconsistent with the exception of household size, we can see suggestive evidence that domestic migration is a particularly important response for households with more labor, less access to land, more migration experience, and fewer assets, as their limited endowments do not provide other opportunities.

[Table 11]

[Table 12]

[Table 13]

Tables 12 and 13 present household land, labor, and asset endowments according to participation in agricultural self-employment, agricultural wage work, nonagricultural self-employment, and nonagricultural wage work. Not surprisingly, households participating in agricultural self-employment use or own more land in 2002 than their counterparts, which is also the case for agricultural wage work. Despite owning or using more land, households engaged in agricultural self-employment also report lower levels of assets in 2002, the vast majority of which is tied up in land. On the other hand, households participating in nonagricultural self or wage work own or use less land. This is intuitive as households with more land are less likely to engage in other income-generating activities, including migration, in response to the heat-induced crop losses of others. Households participating in nonagricultural self-employment are also more likely to own private land in 2002 and have a higher labor-to-land ratio than those who do not. In addition to having less land than their counterparts, households that participate in nonagricultural self or wage employment tend to have more migration experience. Interestingly, households participating in either form of wage employment (agricultural or nonagricultural) report less education for the household head and lower assets values in 2002 than their counterparts, suggesting that wage work does not necessarily represent enhanced opportunities for wealthier households in these communities. Although strictly descriptive and often lacking statistically significant differences, Tables 11-13 provide suggestive evidence regarding the influence of existing endowments in shaping diverging responses to the observation of heat-induced catastrophic crop losses.

7.7 Alternative Explanations

It remains possible that there are alternative explanations for the observed migration and local labor reallocations. Prime candidates include general equilibrium labor shifts, as well as moderate crop losses within the household, drops in productivity, and increased violence or crime associated with extreme heat events. Changes in the demand for and value of labor in the community are particularly concerning for local labor allocations and may also have bearing on migration decisions. In order to assess the extent to which changes in the local labor market represent an alternative explanation, I adapt the bottom half of Table 1 to show the relative percentage of individuals who report each type of employment activity over time in Table 14. Although I observe a reduction in the percent of individuals in each category over time in Table 1, I also see in Table 13 that the relative share for each employment category is nearly identical. In fact, the difference of the relative proportions for each category over time are no larger than 1 percent. This is not indicative of a substantial general equilibrium shift in labor, which effectively rules out this alternative explanation.

[Table 14]

However, the prospects of alternative mechanisms associated with extreme heat remain. In order to assess whether alternative explanations such as moderate crop losses within the household, drops in productivity, deteriorating health, and increased violence or crime are influential, I implement a mechanism testing method developed by Acharya, Blackwell, and Sen (2016). This is of particular concern in the context of an IV, as the salience of an alternative explanations would imply a violation of the exclusion restriction (**A3**). While this is ultimately a conceptual issue, this approach may help characterize the salience of alternative explanations and, thereby, the plausibility that an exclusion restriction is met. In particular, this method facilitates exploring whether variation in an instrument (i.e., exposure or treatment) explains an outcome, net of a mechanism (mediator). This can be thought of as a falsification test of the exclusion restriction. If correlation between an instrument and an outcome remains strong and statistically significant after netting out the influence of the mechanism of interest, then alternative mechanisms are likely relevant and satisfying the exclusion restriction is unlikely.

Accordingly, I test whether correlation remains between extreme heat and labor outcomes, net of the crop loss mechanism. Given the remaining household-level selection with respect to agricultural engagement and vulnerability to shocks, the full role of the agricultural crop loss mechanism is likely not captured in this empirical exercise; in other words, δ in equation (7) will be underestimated. This implies that the potential for finding evidence of an alternate influence of extreme temperature deviations on migration and local labor outcomes is more likely.

The collection of results presented in Tables 15 and 16 generally indicate that, net of heat-induced crop losses, extreme heat deviations *do not* have a statistically significant relationship with migration and labor outcomes. Beginning with Table 15 for migration, we see that all estimates are statistically insignificant and the magnitudes of the coefficients are minuscule. For example, the remaining effect of extreme heat on migration decisions ranges from 0.0001 to 0.0021 percentage points. These are equivalent to proportionately small increases of 0.025 to 0.035 percent, which *cannot* be distinguished from zero due to a lack of statistical significance. We observe the same pattern of very small, statistically insignificant results for local labor outcomes in Table 16. The effect of heat deviations on local labor, net of the crop loss mechanism, ranges from –0.0058 to 0.0033 percentage points. Again, these translate to proportionately small changes of –0.048 to 0.020 percent, which *cannot* be distinguished from zero.

This evidence indicates that there is *not* a strong relationship between extreme heat and labor decisions outside of the agricultural crop loss mechanism. This suggests that alternative explanations associated with extreme heat including moderate crop losses within the household, drops in productivity, deteriorating health, and increased violence or crime are not influential. This can also be interpreted as partial evidence regarding the plausibility that the exclusion restriction may be satisfied. In combination with the lack of substantial general equilibrium labor dynamics, this evidence rules out the most prominent alternative explanations. While it is possible that other mechanisms independent of extreme heat remain, this empirical exercise provides comprehensive evidence that catastrophic crop losses are the dominant temperature-induced mechanism shaping migration and local labor reallocations.

[Table 15]

[Table 16]

7.8 Interpretation and Summary

Visualizing this collection of results provides an opportunity for a broader consideration of the aforementioned findings. I present coefficient plots for the effect of a one standard deviation increase in the proportion of neighboring households experiencing a heat-induced crop shock on migration and local labor decisions (with 95 percent confidence intervals). A one standard deviation increase in the proportion of neighbors experiencing crop shocks is equivalent to a jump of 10.3 percentage points; thus, the magnitudes of the coefficients represented in these figures are nearly identical to the aforementioned estimates in Tables 5–9. Keep in mind that unaccounted-for household-level selection with respect to agricultural engagement and vulnerability to crop shocks implies that these estimates likely represent lower bounds. In other words, the interpretation and summary below is based on conservative estimates.

Figure 3 demonstrates the international and domestic migration responses in the time periods 2002–2003, 2002–2005, and 2002–2005. It highlights the increase in domestic migration, particularly among females, which is the most consistent result across the coefficient plots. These findings, especially the concentration of the domestic migration responses in the period immediately after the crop shocks to others, is indicative of ex ante adaptation to climate change associated with learning from others. Learning from the crop losses of neighbors is most likely prior to the potential onset of substantial general equilibrium labor shifts. On one hand, it remains possible that individuals learn from the changes in the labor market associated with the catastrophic crop losses. On the other hand, descriptive evidence is not indicative of considerable changes in general equilibrium labor dynamics. Furthermore, exploration of alternative explanations running from heat to migration and labor outcomes demonstrates that many plausible mechanisms, such as moderate crop losses within the household, drops in productivity, or increased violence and crime, do not shape the temperature-labor allocation relationship.

[Figure 3]

This pattern of responses is consistent with adaptation because it likely constitutes a risk diversifying or mitigating action. This is corroborated by the descriptive evidence suggesting that migrants overwhelming engage journeys that represent spatial and sectoral (urban) diversification to climate risk, particularly when crop shocks are experienced within the households or observed at a higher prevalence within the community. In the absence of a catastrophic crop loss within the household and in the context of a learning from others mechanism, increased domestic migration is indicative of ex ante adaptation to climate change. Although less consistently and precisely estimated, international migration may represent a shift in income risk, as climatic and economic conditions abroad are even less likely to be correlated with the relevant climate risks in origin communities or in nearby locations within Mexico. However, costlier international migration appears to constitute less of an ex ante adaptation to the heat-induced crop shocks of neighbors relative to domestic migration. The observed ex ante migration response to heat-induced crop losses is consistent with the results presented by Feng, Krueger, and Oppenheimer (2010) and Jessoe, Manning, and Taylor (2018).

Figure 4 shows that the increase in agricultural self-employment that appears to be driven by males is partially offset by the decrease in agricultural wage employment. Much of this increase in agricultural self-employment appears to have been sustained through 2005, though the pattern of results may also be suggestive of a partial recovery in agricultural wage employment. The combination of migration and labor allocation adjustments may also be indicative of substitution between domestic migration and local work, such as agricultural wage and nonagricultural self-employment among females, which would represent a noteworthy diversification of income risk. Similarly, among males there may be substitution away from agricultural work toward international migration beyond the observed increase in agricultural self-employment.

[Figure 4]

The pattern of labor adjustment into agricultural self-employment and away from agricultural wage work is not suggestive of ex ante adaptation to climate. First, it is more difficult to disentangle individual labor responses from potential general equilibrium shifts, though it should be noted that the strongest local labor estimates appear in 2002 instead of 2005. In either case, characterizing these labor responses into agricultural self-employment and nonagricultural wage work as strictly being rooted in learning from the crop shocks of others is less plausible. Second, the pattern of labor decisions is unlikely to be consistent with risk mitigation. On the contrary, individuals in nonshocked households appear to devote additional labor to agricultural self-employment activities. This may be explained in at least two different ways. First, there may be a decrease in the demand for labor among households that experienced a crop loss. Alternatively, and potentially in combination, there may be an increase in the value of own labor on agricultural land of nonshocked households. This increase may also be motivated by heightened labor requirements on own land to address the impacts of less severe heat-induced shocks. In either case, these results are in line with the heat-induced ex post reductions in total labor, wage work, and nonfarm employment that Jessoe, Manning, and Taylor (2018) find.

Taken altogether, we observe that migration, especially domestic journeys among females, appears to be a salient ex ante adaptation mechanism to heat-induced crop shocks. This is particularly the case for households with more labor, less land, and fewer assets, whose endowments are not well suited to other responses. This pattern of results largely confirms hypotheses *H1*, *H2A*, and *H3* with respect to migration and the relative magnitude of local labor responses for males (H3A), but not with respect to nonagricultural employment (H2B) or the expected gender-differentials in migration (H3B). Relative to migration, local labor decisions do not appear to be consistent with ex ante adaptation, though hypothesis *H2B* regarding land and agricultural self-employment is corroborated. The local labor findings may be reflective of a dependence on agriculture in rural communities, as well as an inability of local labor markets to absorb labor when local incomes are negatively shocked. This body of evidence, including the onset of most migration and local reallocations in the period immediately after observing the crop losses of others, suggests that the learning from others mechanism is salient, especially with respect to migration that is typically temporary and to a city, other state or country.

7.9 Caveats

The findings of this study should be weighed in the context of the strong identifying assumptions required and a number of data restrictions. This empirical analysis depends on nontrivial assumptions that are central to an IV approach. The assumptions, particularly the independence (A2) and exclusion restrictions (**A2**-**A3**), and the plausibility of satisfying them in this context are discussed in detail in Section 6.

A number of data constraints, in addition to the incomplete information on the timing of migration, are also worth considering. It is not feasible to integrate weather data with the MxFLS at the community level, which likely results in diluted measures of localized extreme heat events given the averaging over a larger spatial area associated with the municipality level. Additionally, the lack of crop specific identifiers limits my ability to assess the extent to which households respond to information about extreme heat events by adapting their agricultural engagement, particularly in terms of crop choices. Both of these data constraints, which can be attributed to data confidentiality protections, limit the capacity to further characterize the temperature-agriculture relationship.[60]

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[60] Preliminary analysis of agricultural outcomes (available upon request), including land use and expenditures on water or total input expenditures, suggests that there are minimal to no anticipatory agricultural adaptations of this kind associated with observing the heat-induced crop losses of others during the study period. While one might expect some observable changes in land or input use to accompany adjustments to crop allocations, this does not necessarily rule out adaptations in crop choices.

Lastly, at least two additional types of data would be helpful in characterizing the motives of migrants and local laborers. Information on revealed behavioral preferences, particularly with respect to risk and time, would be instructive in substantiating or qualifying the climate risk diversification motives of individuals.[61] Similarly, explicit social network information describing the nature of relationships between individuals in a community would be insightful, particularly in considering the extent to which learning from others can be attributed to social learning associated with information as opposed to mimicry – imitating the migration and local labor decisions of other individuals.

8. Robustness

8.1 Ex Post Comparison

Considering the migration and local labor responses to heat-induced crop shocks associated with both learning from others and own experiences provides an opportunity to assess the plausibility of the aforementioned findings and to further contextualize the pattern of results. In the case of migration, where we find evidence suggestive of ex ante adaptation, this constitutes a rough comparison of ex ante and ex post responses to heat-induced crop losses. The lack of observed local labor adjustment that is consistent with ex ante adaptation implies that this exercise is closer to a comparison of learning from others relative to ex post effects for employment outcomes.

In order to quantify the ex post response to experiencing a catastrophic crop loss, consider the following system of equations where I substitute a binary measure of whether a household experienced a crop shock during 2000–2002 ($\mathbb{L}_{h02}$) in place of the proportion of other households in a community experiencing a crop loss over the same period ($\mathbb{A}_{c02}$). This IV specification is estimated for the full rural sample; in other words, households that did experience a catastrophic crop loss are included in addition to those that did not (the analytical sample). Household-level crop losses are instrumented for with the same municipality-level measure of extreme heat ($\mathbb{T}_{m02}$).

$$\mathbb{L}_{h02} = \theta \mathbb{T}_{m02} + \boldsymbol{X}_{ihcm02}{}' \boldsymbol{\sigma} + \lambda_s + u_{ihcms02} \ , \quad (10)$$

$$\mathbb{Y}_{ihcmst} = \gamma \widetilde{\mathbb{L}}_{h02} + \boldsymbol{X}_{ihcm02}{}' \boldsymbol{\pi} + \lambda_s + v_{ihcmst} \ . \quad (11)$$

[61] Information on risk preferences is available beginning in the 2005 wave of the MxFLS, but is not available in the 2002 survey.

In the estimation of ex post responses, I set aside the spillovers associated with learning from others for four reasons: (i) to maintain consistency with the ex post climate shock literature; (ii) because the magnitude of learning from others effects are likely to be of second-order importance among households that directly experience a catastrophic crop loss; (iii) household- and community-level measures of catastrophic crop loss are, by construction, highly correlated; and (iv) identification of both the household- and community-level endogenous regressors requires an additional exogenous instrument, ideally one that is more determinant of household-level crop outcomes. Ignoring spillovers for this exercise implies that SUTVA is satisfied with respect to non-interference (**A1.2**), though the main results of this study demonstrate that this unlikely.

I do not interpret the ex post estimates on their own because, as expected, municipality-level heat values ($\mathbb{T}_{\mathrm{m02}}$) are not as predictive of household-level catastrophic crop losses ($\mathbb{L}_{h02}$) compared to community-level crop shocks ($\mathbb{A}_{c02}$). In this case, remaining household-level selection on agricultural participation and vulnerability to shocks may result in upwardly biased estimates of ex post responses (γ). This potential bias operates in the opposite direction of the possible bias associated with the ex ante estimates. On the other hand, these estimates are identified relative to the aforementioned ex ante responses of households that did not experience heat-induced crop shocks. Considering the salience of ex ante responses, these may instead be underestimates of ex post labor reallocations. It is, therefore, unclear if the ex post estimates ultimately represent underestimates or overestimates, so I do not interpret the ex post estimates on their own.

Ex ante or learning from others estimates are scaled by a one standard deviation increase in the community proportion of neighbors experiencing a crop loss (0.103), while the ex post estimates are scaled by a one standard deviation increase in the household-level measure of experiencing a crop shock (0.263). In presenting ex ante or learning from others (β in equation 6) and ex post (γ in equation 11) estimates, Tables 17 and 18 compare the direction and magnitude of migration and local labor responses for the subsample of households that did not experience a crop shock relative to the ex post responses of individuals from households that did experience a catastrophic crop loss.[62] I also present the ratio of ex ante estimates to ex post estimates, as well

[62] Full ex post results are available upon request.

as the relative contribution of ex ante estimates to the total. Considering the potential for negative selection in ex ante estimates and unclear bias in the ex post estimates, the ratio and relative contribution statistics should be viewed as approximate.

Table 17 for migration outcomes demonstrates that while the directions of ex ante responses in column 1 and ex post effects in column 2 are consistent, the magnitude of ex post effects is considerably larger. Focusing on the cases where both estimates are statistically significant, we observe in column 3 that the size of the ex ante international migration response is equivalent to 40 to 47 percent of the ex post response. Notably, the magnitude of the initial ex ante migration effect in 2002 is roughly 47 percent the size of the ex post effect over the same period. In the case of domestic migration, the magnitude of the ex ante response is equivalent to 51 to 60 percent of the ex post response (column 3). The magnitude of the initial ex ante effect for domestic migration in 2002 is comparable to 51 percent of the ex post effect.

Overall, the relative contribution of ex ante migration in column 4 is roughly one-quarter to two-fifths of the total international or domestic migration response to heat-induced crop shocks. This pattern matches the expectation that ex post effects should be considerably larger than ex ante impacts. The temporal pattern where migration during 2002–2003 represents a larger proportion of total migration than migration during 2004–2005 also provides corroborating evidence regarding the validity of the ex ante findings. These results also suggest that ex ante migration may represent a larger share of the total migration responses than previously theorized or documented.

[Table 17]

Table 18 for local labor outcomes demonstrates that the learning from others responses are also in the same direction as the ex post responses across columns 1 and 2. Additionally, the magnitude of the ex post effects continues to be considerably larger. The learning from others effect for agricultural self-employment is equivalent to 37 to 44 percent of the ex post effect (column 3), which constitutes one-quarter to one-third of the total agricultural self-employment response (column 4). As expected, we see that the learning from others response in 2002 represents a larger proportion than the 2005 response. In the case of agricultural wage employment, the size of the learning from others effect is equivalent to 65 percent of the ex post effect (column 3), representing over one-third of the total agricultural wage employment response (column 4). While it is unlikely that the learning from others local labor responses constitute ex ante adaptation, the consistency in the overall pattern of results helps confirm the credibility of the findings.

[Table 18]

8.2 Region Fixed Effects

I explore the sensitivity of results to the inclusion of the region fixed effects in place of state fixed effects. State fixed effects are likely preferable because they restrict comparisons to the most comparable communities given that the state represents the next largest spatial and administrative level to the municipality, the level at which extreme heat exposure is modeled. State level fixed effects are also fitting given that they closely correspond with time-invariant institutional experiences and contextual characteristics, such as persistent labor market conditions and migration histories at the state level described in sub-section 6.1.

That being said, state fixed effects implies that estimates are identified based on variation from 45 rural communities clustered within 12 states, which translates to fewer than four communities per state. This is a relatively small number of sampling units per state and coefficients may, as a result, be sensitive to the relatively small number of communities (and the associated sampling) within each state. As an alternative, I specify region level fixed effects following the stratification involved in the MxFLS sampling design for five regions: (i) Northwest – Sonora and Sinaloa; (ii) Northeast – Coahuila and Durango; (iii) Center – Puebla, Morelos and State of México; (iv) Centerwest – Michoacán and Guanajuato; and (v) South and Southeast – Yucatán, Veracruz and Oaxaca. The main tradeoff in specifying region instead of state fixed effects is less sensitivity to the relatively small number of primary sampling units (and their sampling) within fixed effects units but a diminished ability to account for unobserved state-level institutional experiences and contextual characteristics.

In Tables 19 and 20, I present the community crop loss coefficient (and associated F-statistics) for specifications with state fixed effects (column 1) and region fixed effects (column 2). Although F-statistics remain above the heteroskedastic-robust rule-of-thumb of 23 with region fixed effects, they are considerably smaller and indicative of a weaker first stage. This may be explained by a looser accounting of contextual factors, including meso-level agro-ecological conditions, which are critical for shaping crop-environment interactions. Not surprisingly, coefficients of interest also tend to be less precisely estimated with region fixed effects.

Coefficients describing migration outcomes in Table 19 are all of the same sign across columns and the magnitude of estimates are comparable in the majority of cases, particularly those where coefficients are precisely estimated. With the exception of agricultural wage employment, coefficients characterizing local employment outcomes in Table 20 are also of a consistent sign and of comparable magnitudes. The overarching takeaway from this exercise is that the overall pattern of findings is moderately sensitive to the relatively small number of primary sampling units (and their sampling), with the domestic migration and agricultural self-employment estimates standing out as being the most robust.

In particular, I highlight the similarity in domestic migration results for 2002-2003 and 2002-2005 in Table 19, despite the weaker first stage. The domestic migration coefficients for 2002-2003 of 0.0249 and 0.0248 percentage points are nearly identical and are statistically significant at the 1 percent level with state or regional fixed effects, respectively. Domestic migration estimates for 2002-2005 of 0.0296 (significant at the 1 percent level) and 0.0281 (significant at the 5 percent level) are also extremely similar. While results are inconsistent for agricultural wage employment in Table 20, estimates for agricultural self-employment remain reasonably comparable – ranging from 0.0855 (significant at the 1 percent level) to 0.0511 (significant at the 5 percent level) in 2002 and 0.0528 (significant at the 1 percent level) to 0.0375 (significant at the 10 percent level) in 2005.

[Table 19]

[Table 20]

8.3 Confounding Catastrophic Crop Shocks

Catastrophic crop shocks experienced from 2003 to 2005 represent a potential threat to the validity of these findings. While I focus on the impact of heat-induced crop losses from 2000 to 2002, it is possible that households also experienced crop shocks from 2003 to 2005. Catastrophic crop losses from 2003 to 2005 may also shape the flow of migrants after 2002 and local labor outcomes in

2005. If this is the case, the aforementioned findings may be spurious. In order to address this, I first document the number of households experiencing a catastrophic crop shock from 2003 to 2005. Only 40 households report a crop shock after 2002, 11 of which did experience a catastrophic crop loss from 2000 to 2002 while 29 of did not. Given this relatively small number, it is unlikely that crop shocks from 2003 to 2005 contribute to the aforementioned results. Nonetheless, I reestimate the 2005 local labor as well as the 2002–2003, 2004–2005, and 2002–2005 migration specifications, excluding the households that experienced catastrophic crop losses during 2003–2005. Not surprisingly, findings are not sensitive to catastrophic crop shocks during 2003–2005.[63] I observe approximately the same magnitude and pattern of statistically significant results for the full sample, females, and males. Catastrophic crop shocks occurring from 2003 to 2005 are not a confounding factor.

8.4 Attrition

The potential for systematic attrition is always a concern when working with panel data. Over 90 percent of households sampled during the first round of the MxFLS in 2002 were reinterviewed during the follow-up wave in 2005 (Rubalcava, 2007; Rubalcava and Teruel, 2013). While this represents a moderate level of attrition, we observe a difference of 546 observations in the estimation of 2002 labor outcomes (Table 6) relative to the estimation of 2005 labor outcomes (Table 8). This is a nonnegligible number, and if this attrition is nonrandom, it is possible that the findings may be sensitive to the composition of the analytical sample. In order to assess this, I first explore the extent to which this attrition can be accounted for. I find that 166 observations migrated out of the sample, 84 retired, and 71 died. Thus, 321 of the 546 observations can be accounted for, which leaves 225 observations unaccounted for. I then reestimate the 2002 local labor specifications for the subsample of observations that remain in the MxFLS sample in 2005 to verify if attrition is influential in shaping these findings. The 2002 findings are not sensitive to attrition.[64]

8.5 Learning about Risk from Others

[63] Confounding crop loss results are available upon request.
[64] Attrition results are available upon request.

I assess the extent to which the strength of a learning from others signal in rural, agricultural communities shapes ex ante and learning from others responses. In many ways, this also constitutes a test of the learning about risk from others model that I propose. The preceding analysis is based on the restriction of observations to communities where at least 40 percent of households report land use or ownership, to ensure that the learning from others mechanism is relevant. I vary this cutoff from 20 to 60 percent (in intervals of 10) to explore heterogeneity in the salience of the learning from others signal and the stability of estimates.[65] Each coefficient can be thought of as a weighted average of estimates from that threshold upward (i.e., from that threshold level to the right in each figure). I use two benchmarks to characterize the signal across thresholds: (i) the size of and pattern of confidence intervals, which also depend on the strength of the first stage, and (ii) the stability of the estimated coefficients.

Figures 5–10 illustrate that confidence intervals tend to be the tightest at the 40 or 50 percent cutoffs across nearly all outcomes.[66] Similarly, estimates are relatively stable from 20 to 50 percent, above which coefficients jump considerably (along with confidence intervals), likely due to the drop in the number of communities and observations, as well as the associated weaker first stage. These findings suggest that 20 percent may be a reasonable minimum threshold for a credible agriculturally based learning from others signal. This is true both for migration and local labor outcomes, though the pattern is clearest for migration as there is more variation in the local labor outcomes. The stability of the estimates also implies that incorporating more clusters within states by lowering the land use or ownership threshold to 30 or 20 percent does not influence the results. The change in the overall pattern at 60 percent may also be related to the increasingly agriculturally dependent profile of communities. These figures indicate that results are robust to the choice of minimum agricultural land ownership or use thresholds.

[Figures 5–10]

[65] Full signal results are available upon request. At the 60 percent cutoff, the number of communities and observations begins to fall precipitously. As a result, the estimates at 60 percent are less informative, and those above 60 percent are not feasible in this IV framework with state fixed effects. The number of observations at each threshold range from 2,795 to 3,424 at 20 percent, 2,639 to 3,238 at 30 percent, 2,416 to 2,952 at 40 percent, 2,113 to 2,586 at 50 percent, and 1,691 to 2,088 at 60 percent. The number of communities at each threshold are 60 at 20 percent, 52 at 30 percent, 45 at 40 percent, 38 at 50 percent, and 29 at 60 percent.

[66] Heteroskedasticity-robuts *F*-statics range from 40 to 47 at 20 percent, 46 to 77 at 30 percent, 72 to 114 at 40 percent, 56 to 88 at 50 percent, and 6 to 69 at 60 percent.

9. Discussion

Individuals engage in ex ante migration to mitigate against the likelihood of heat-induced crop shocks in the future, particularly females, most frequently engaging in temporary journeys to urban or distant locations. In response to the same information about future climate risk in their communities, individuals shift labor onto their own land, especially males, perhaps as a measure of last resort. These local labor and ex ante migration responses are not shaped by alternative explanations including general equilibrium labor dynamics, moderate crop losses within the household, drops in productivity, and increased violence or crime. The overall pattern of increases in agricultural self-employment and decreases in agricultural wage employment with ex ante increases in domestic migration are consistent with the ex post responses in the study communities as well as the ex post findings presented by Jessoe, Manning, and Taylor (2018) in a distinct set of rural, agricultural communities in Mexico. This combination of migration and local labor responses associated with learning from others is indicative of risk diversification in the case of migration and intensification in other cases. These findings and their implications are subject to the identifying assumptions embedded in the empirical strategy discussed in Sections 1 and 6 and should also be interpreted in light of the data limitations described in Section 7.

As detailed in the introduction, this study contributes to the extant literature by demonstrating that individuals mitigate against the threat of destabilizing climate events through domestic migration and by highlighting that one of the reasons for so-called adaptation gaps is the omission of anticipatory behavior. Two additional contributions are worth considering.

First, I illustrate that learning about the crop losses of others is a salient information channel in the context of climate change. By focusing on ex post effects and responses, the extant literature emphasizes the information that individuals and households directly learn from their own experiences. In contrast, this research demonstrates the importance of additionally considering what individuals and households learn through information channels other than their own experiences (Carleton and Hsiang 2016). Although I do not explicitly model learning from specific neighbors, due to the absence of data on social ties and networks, these findings are suggestive of a learning mechanism that has largely been identified in the adoption of improved technologies (Besley and Case, 1994; Foster and Rosenzweig 1995; Munshi 2004; Bandiera and Rasul 2006;

Conley and Udry 2010). This study highlights the relevance of this type of learning mechanism that features indirect information in the context of climate change.

Second, this study also contributes to a growing body of literature demonstrating that agriculture is a major if not the dominant mechanism through which the environment influences migration in rural areas (Feng, Krueger, and Oppenheimer, 2010; Hornbeck, 2012; Cai et al., 2016; Jessoe, Manning, and Taylor, 2018). Though the importance of this mechanism is established for local labor and it has long been hypothesized about for migration, few studies have explicitly shown this with respect to ex ante or ex post migration.

In addition to contributing to extant research on coping with shocks and climate change, as well as the environment-agriculture-migration relationship, this study has three important implications for policy and future research. First, the finding that ex ante migration is a salient adaptation strategy and that it is of a nontrivial magnitude suggests that projections of future environmental migration, which do not account for ex ante mobility, may be understated.

Second, the finding that some individuals adapt to the increased likelihood of climate-induced crop shocks via ex ante migration, most likely to urban or distant locations, while others respond by intensifying labor participation on their own land suggests that not all households are well positioned to mitigate climate risk. In fact, it may be the case that some households and communities are able to insure against climate risk with a combination of ex ante and ex post responses. Meanwhile, others that cannot may not only suffer the adverse impacts of future catastrophic crop losses but also compound their exposure to destabilizing climate events over time for lack of better options. Alderman and Paxson (1994) emphasize that information on how and how well different types of households mitigate risk is crucial to guiding policy design. In the context of this study, uneven adaptation to climate change shaped by preexisting labor and land endowments implies that climate shocks may intensify vulnerability to future shocks, especially among households whose livelihoods rely on land. Lastly, these results have direct implications for the effective and efficient design and targeting of climate change mitigation policies, which should serve the needs of households that directly experience climate-induced crop shocks and those who do not but may respond in a manner that puts them at greater future income risk.

In drawing attention to the idea that individuals and households do adapt to climate risk prior to the onset of destabilizing events like climate-induced catastrophic crop losses, I emphasize the importance of considering what agents learn from those around them. In other words, indirect information channels about the probability of future climate-induced crop shocks are informative beyond what individuals and households learn from their own experiences. This is particularly important for policy makers and researchers in their assessments of observed adaptation to climate change or the lack thereof, in other words, adaptation gaps (Carleton and Hsiang, 2016), and what should be done moving forward. This also has bearing on migration projections, which likely do not account for the possibility of ex ante migration associated with climate phenomena. In this way, these findings have important implications for the design and targeting of climate change mitigation policies.

This study also raises a number of questions for future work. First, are there other anticipatory strategies that individuals and households use to mitigate against climate shocks? Second, how do households that send migrants in advance of catastrophic shocks fare economically? Third, how do the experiences and economic outcomes of ex ante migrants compare with those of ex post migrants? Fourth, do climate-induced migrants fare better or worse than migrants in more opportunistic situations? These are but a few of the pertinent questions we must tackle to gain a thorough understanding of the broader climate-migration dynamic and its effect on the welfare of rural households.

10. References

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11. Figures & Tables

Figure 1: MxFLS Municipalities

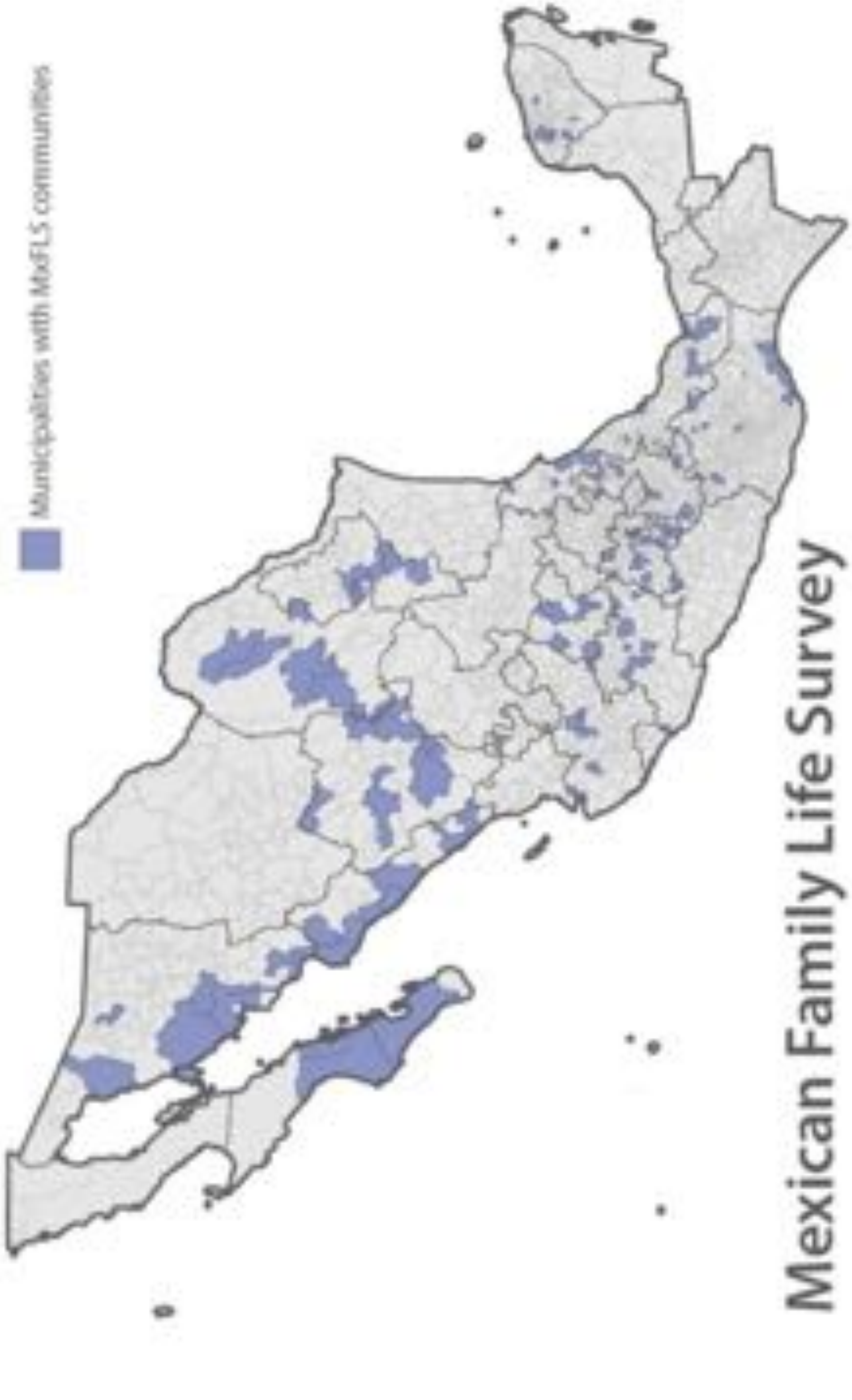


Figure 2

Rising Annual Temperature in Mexico (1980-2010)

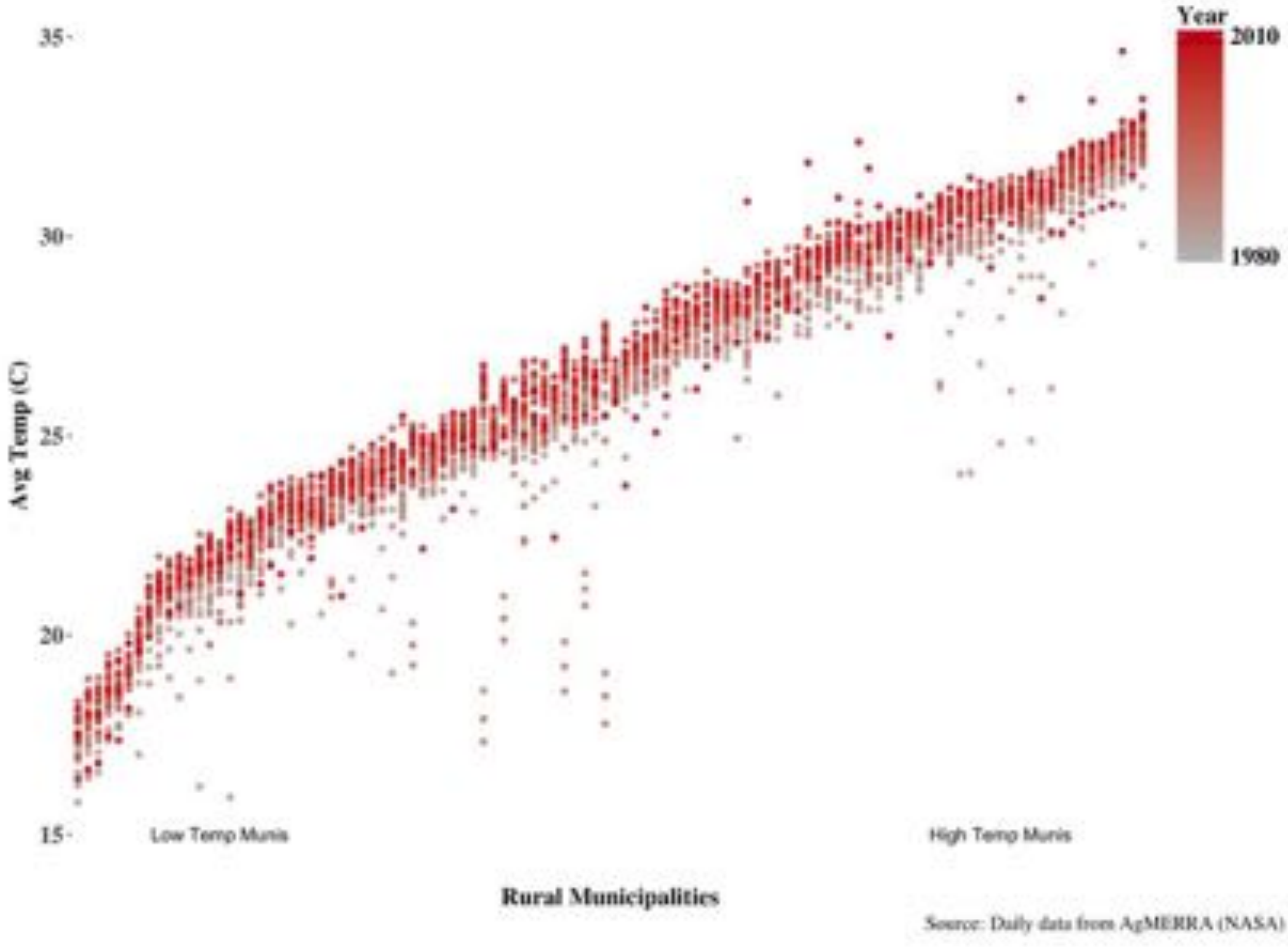


Table 1: Mean of Individual Level Migration & Local Labor Outcomes

	Full Sample	Female	Male
	(1)	(2)	(3)
	Mean	Mean	Mean
Intl Migr 02-03	0.003	0.001	0.006
Intl Migr 04-05	0.006	0.005	0.008
Intl Migr 02-05	0.05	0.04	0.07
Dom Migr 02-03	0.03	0.03	0.02
Dom Migr 04-05	0.02	0.02	0.02
Dom Migr (lower) 02-05	0.05	0.05	0.05
Dom Migr (upper) 02-05	0.07	0.07	0.07
N	3343	1716	1627
Ag Self 02	0.15	0.02	0.30
Ag Wage 02	0.13	0.05	0.22
Non-Ag Self 02	0.15	0.15	0.15
Non-Ag Wage 02	0.21	0.19	0.23
N	3062	1636	1426
Ag Self 05	0.14	0.02	0.29
Ag Wage 05	0.11	0.02	0.21
Non-Ag Self 05	0.13	0.12	0.13
Non-Ag Wage 05	0.19	0.15	0.24
N	2659	1475	1184

Table 2: Mean of Key Control Variables (household level units)

	(1) Mean	(2) SD
Com proportion crop loss (00-02)	0.08	0.10
Temp total deviation (>+1SD) spell (00-02)	26.41	11.03
Temp total HDD (>30°) spell (00-02)	17.51	33.56
HH land (ha)	4.86	14.04
HH land private	0.21	0.41
HH land ejido	0.74	0.44
HH land other	0.11	0.31
Mun % land irrigated	0.36	0.38
Mun % land with maize	0.10	0.13
Mun % land with coffee	0.02	0.06
Mun % land with wheat	0.02	0.03
HH previous migrant	0.40	0.49
HH size	4.55	2.40
Mun migration intensity	0.11	0.99
Mun economic diversity	0.68	0.22
Mun marginalization index	-0.24	0.87
Mun population (10,000s of individuals)	5.94	11.56
N	1160	

Table 3: Selection Check

	Low Crop Loss Comm		High Crop Loss Comm		Difference in Differences	
	(1) HH Crop Loss Mean	(2) No HH Crop Loss Mean	(3) HH Crop Loss Mean	(4) No HH Crop Loss Mean	(5) Difference	(6) Standard Error
Municipality						
% maize	0.12	0.07	0.16	0.17	-0.06	(0.05)
% coffee	0.04	0.02	0.02	0.03	-0.03*	(0.01)
% wheat	0.01	0.02	0.01	0.01	0.00	(0.00)
% land irrig	0.24	0.42	0.23	0.20	0.21**	(0.08)
Household						
Land (ha)	7.44	3.91	8.25	6.85	-2.13	(3.01)
Land private	0.45	0.17	0.38	0.32	-0.21*	(0.11)
Land ejido	0.66	0.79	0.58	0.62	0.09	(0.14)
Land other	0.09	0.09	0.10	0.12	-0.02	(0.06)
Size	4.91	4.62	4.84	4.49	0.06	(0.48)
Previous migr	0.41	0.44	0.37	0.35	0.04	(0.08)
Head age	54.87	52.4	52.55	53.77	-3.68	(2.80)
Head education	3.93	3.64	3.16	3.09	-0.22	(0.66)
Ag empl	0.65	0.55	0.69	0.65	-0.06	(0.10)
Non-ag empl	0.74	0.65	0.53	0.44	0.01	(0.09)
Piped water	0.91	0.86	0.79	0.79	-0.05	(0.07)
Toilet	0.45	0.4	0.38	0.36	-0.02	(0.09)
Loan	0.33	0.20	0.27	0.18	-0.04	(0.08)
N	50	851	146	414	1461	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. High crop loss community $\geq$ 10% households report crop loss. Difference in Differences = column [(2)-(1)]-[(4)-(3)]. The single difference for households without crop loss can be evaluated with columns [(2)-(4)] while the single difference for households with crop loss can be evaluated with columns [(1)-(3)].

Table 4: Community Crop Loss Outcomes for *Ex Ante* Migration & Employment [IV - 1st Stage]

	Proportion of neighbors with crop loss 00-02					
	Migration			Employment		
	(1) Deviations	(2) HDD	(3) Interaction	(4) Deviations	(5) HDD	(6) Interaction
Temp total deviation (>+1SD) spell (00-02)	0.073***			0.065***		
	(0.014)			(0.012)		
Temp total HDD (>30°) spell (00-02)		0.020***			0.026***	
		(0.004)			(0.004)	
Temp total spell interaction (00-02)			0.052***			0.053***
			(0.006)			(0.005)
HH land (ha)	0.002*	0.003	0.003	0.004***	0.004***	0.003***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
HH land ejido	-0.359***	-0.359***	-0.340***	-0.358***	-0.344**	-0.350***
	(0.106)	(0.125)	(0.124)	(0.121)	(0.134)	(0.124)
HH land other	-0.215***	-0.214**	-0.213**	-0.177***	-0.192**	-0.193**
	(0.074)	(0.092)	(0.092)	(0.064)	(0.092)	(0.092)
Age	-0.000	0.001	0.001	-0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male	-0.000	0.003	0.003	-0.005	-0.008	0.008
	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)
Union	0.022	0.025	0.023	0.019	0.020	0.019
	(0.024)	(0.025)	(0.025)	(0.024)	(0.026)	(0.026)
Years of education	0.001	0.002	0.003	-0.000	0.001	0.002
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Student	0.026	0.064	0.068	0.031	0.069	0.073
	(0.041)	(0.049)	(0.049)	(0.042)	(0.049)	(0.049)
HH size	-0.001	0.002	0.001	-0.006	-0.001	-0.002
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
HH # adult females	-0.026	-0.017	-0.019	-0.044	-0.028	-0.029
	(0.035)	(0.038)	(0.038)	(0.051)	(0.053)	(0.053)
HH # adult males	0.011	0.016	0.015	0.010	0.014	0.013
	(0.027)	(0.026)	(0.026)	(0.030)	(0.028)	(0.028)
HH head age	-0.000	0.000	0.000	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
HH head education	-0.007	-0.002	-0.003	-0.008	-0.004	-0.004
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
HH previous migrant	-0.074	-0.122**	-0.120**	-0.083*	-0.129**	-0.126**
	(0.046)	(0.049)	(0.050)	(0.049)	(0.052)	(0.052)
HH loan	-0.059	-0.114**	-0.102**	-0.060	-0.118***	-0.100**
	(0.037)	(0.046)	(0.047)	(0.039)	(0.045)	(0.046)
HH piped water	0.312***	0.141	0.133	0.226**	0.091	0.085
	(0.104)	(0.134)	(0.120)	(0.089)	(0.102)	(0.097)
HH toilet	-0.169**	-0.165**	-0.167**	-0.150**	-0.159**	-0.162**
	(0.069)	(0.076)	(0.077)	(0.069)	(0.076)	(0.076)
Com bus stop	-0.067	0.217	0.139	0.034	0.247	0.166
	(0.282)	(0.298)	(0.292)	(0.290)	(0.300)	(0.295)
Com hospital	-0.426	0.466*	0.193	-0.522	0.950**	0.233
	(0.539)	(0.501)	(0.457)	(0.492)	(0.439)	(0.409)
Com secondary school	-0.823**	-0.289	-0.369	-0.611**	-0.269	-0.273
	(0.331)	(0.318)	(0.317)	(0.259)	(0.264)	(0.263)
Com market	0.407	0.045	0.062	0.361***	0.164	0.177
	(0.303)	(0.297)	(0.302)	(0.210)	(0.232)	(0.242)
Mun % land irrigated	-0.013*	-0.018**	-0.018**	-0.008	-0.016***	-0.016***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
Mun % land with maize	0.007	-0.008	-0.006	0.006	-0.008	-0.008
	(0.013)	(0.013)	(0.015)	(0.013)	(0.015)	(0.015)
Mun % land with coffee	-0.048***	-0.023	-0.025	-0.039**	-0.018	-0.021
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)
Mun % land with wheat	-0.062	-0.005	-0.015	-0.037	0.007	-0.005
	(0.039)	(0.027)	(0.027)	(0.032)	(0.022)	(0.023)
Mun population (10,000s of individuals)	-0.029***	0.005	0.005	-0.026***	0.006	0.008
	(0.009)	(0.005)	(0.005)	(0.008)	(0.004)	(0.004)
Mun economic diversity	-1.297**	-1.392*	-1.407*	-2.126***	-1.907***	-1.898***
	(0.743)	(0.840)	(0.841)	(0.495)	(0.564)	(0.567)
Mun marginalization index	0.142	-0.071	-0.095	0.087	-0.098	-0.111
	(0.242)	(0.299)	(0.299)	(0.216)	(0.285)	(0.286)
Mun migration intensity	-0.313*	-0.327*	-0.308	-0.206	-0.250	-0.244
	(0.168)	(0.193)	(0.190)	(0.179)	(0.170)	(0.166)
State FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	72	75	773	29	49	114
First stage *F*-stat (KP)	72	73	71	28	48	112
First stage *F*-stat (CD)	236	364	359	769	340	399
N	2908	2908	2908	2962	2962	2962
Mean of outcome	0.08	0.08	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table 5: *Ex Ante* 2002-2003 Migration Outcomes [IV 2nd-Stage]

	Migration 02-03	
	(1) International	(2) Domestic
PANEL A: Full Sample		
Community crop loss (00-02)	0.008***	0.026***
	(0.002)	(0.007)
F-stat (MP)	73	73
N	2908	2910
R^2	0.01	0.02
Mean of outcome	0.003	0.03
PANEL B: Female Sample		
Community crop loss (00-02)	0.015***	0.036***
	(0.002)	(0.011)
F-stat (MP)	78	78
N	1516	1517
R^2	-0.02	0.03
Mean of outcome	0.001	0.03
PANEL C: Male Sample		
Community crop loss (00-02)	0.001	0.013**
	(0.003)	(0.007)
F-stat (MP)	66	65
N	1392	1393
R^2	0.03	0.04
Mean of outcome	0.004	0.03

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 6: *Ex Ante* 2002 Employment Outcomes [IV 2nd-Stage]

	Employment 02			
	(1) Ag Self	(2) Ag Wage	(3) Non-Ag Self	(4) Non-Ag Wage
PANEL A: Full Sample				
Community crop loss (00-02)	0.085***	-0.071***	-0.006	-0.029
	(0.011)	(0.024)	(0.028)	(0.045)
F-stat (MP)	114	114	114	114
N	2962	2962	2962	2962
R^2	0.29	0.14	0.04	0.21
Mean of outcome	0.16	0.12	0.14	0.21
PANEL B: Female Sample				
Community crop loss (00-02)	0.009	-0.038***	-0.036	-0.020
	(0.011)	(0.014)	(0.034)	(0.042)
F-stat (MP)	118	118	118	118
N	1545	1545	1545	1545
R^2	0.10	0.09	0.07	0.24
Mean of outcome	0.02	0.04	0.14	0.20
PANEL C: Male Sample				
Community crop loss (00-02)	0.156***	-0.097**	0.036*	-0.038
	(0.023)	(0.045)	(0.021)	(0.065)
F-stat (MP)	107	107	107	107
N	1417	1417	1417	1417
R^2	0.28	0.13	0.06	0.22
Mean of outcome	0.32	0.21	0.15	0.22

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student at any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 7: *Ex Ante* 2004-2005 Migration Outcomes [IV 2nd-Stage]

	Migration 04-05	
	(1) International	(2) Domestic
PANEL A: Full Sample		
Community crop loss (00-02))	-0.010**	-0.010
	(0.005)	(0.012)
F-stat (MP)	73	73
N	2908	2908
R^2	0.04	0.08
Mean of outcome	0.01	0.02
PANEL B: Female Sample		
Community crop loss (00-02)	-0.010	-0.017*
	(0.008)	(0.010)
F-stat (MP)	79	79
N	1516	1516
R^2	0.04	0.08
Mean of outcome	0.005	0.02
PANEL C: Male Sample		
Community crop loss (00-02)	-0.009	-0.005
	(0.006)	(0.014)
F-stat (MP)	66	66
N	1392	1392
R^2	0.06	0.11
Mean of outcome	0.01	0.02

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loans, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 8: *Ex Ante* 2005 Employment Outcomes [IV 2nd-Stage]

	Employment 05			
	(1) Ag Self	(2) Ag Wage	(3) Non-Ag Self	(4) Non-Ag Wage
PANEL A: Full Sample				
Community crop loss (00-02)	0.054***	-0.009	-0.012	-0.015
	(0.012)	(0.016)	(0.025)	(0.025)
F-stat (MP)	72	72	72	74
N	2416	2416	2416	2416
R^2	0.34	0.21	0.11	0.27
Mean of outcome	0.15	0.11	0.11	0.19
PANEL B: Female Sample				
Community crop loss (00-02)	0.010*	-0.033**	-0.056**	-0.006
	(0.005)	(0.015)	(0.027)	(0.025)
F-stat (MP)	73	75	75	78
N	1346	1346	1346	1346
R^2	0.07	0.09	0.17	0.28
Mean of outcome	0.02	0.02	0.10	0.15
PANEL C: Male Sample				
Community crop loss (00-02)	0.110***	0.025	0.040	-0.026
	(0.028)	(0.028)	(0.028)	(0.030)
F-stat (MP)	64	63	64	65
N	1070	1070	1070	1070
R^2	0.30	0.19	0.10	0.32
Mean of outcome	0.31	0.21	0.12	0.23

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 9: *Ex Ante* 2002-2005 Migration Outcomes [IV 2nd-Stage]

	Migration 02-05		
	(1) International	(2) Domestic Lower	(3) Domestic Upper
PANEL A: Full Sample			
Community crop loss (00-02))	0.010	0.030**	0.040**
	(0.011)	(0.012)	(0.017)
F-stat (MP)	74	73	75
N	2919	2910	2952
R^2	0.09	0.06	0.04
Mean of outcome	0.04	0.05	0.06
PANEL B: Female Sample			
Community crop loss (00-02)	-0.004	0.029***	0.031**
	(0.011)	(0.010)	(0.014)
F-stat (MP)	78	77	83
N	1523	1517	1539
R^2	0.07	0.07	0.05
Mean of outcome	0.03	0.05	0.06
PANEL C: Male Sample			
Community crop loss (00-02)	0.030*	0.027	0.044*
	(0.016)	(0.019)	(0.022)
F-stat (MP)	67	66	67
N	1396	1393	1413
R^2	0.13	0.08	0.06
Mean of outcome	0.06	0.05	0.07

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 10: Mean of Individual Level Migration Destination & Persistence Outcomes

	All Comm				Non-Shocked HH			
	Shocked HH	Non-Shocked HH	Summary Statistics		Low Shock Comm	High Shock Comm	Summary Statistics	
	(1) Mean	(2) Mean	(3) Difference	(4) SE	(5) Mean	(6) Mean	(7) Difference	(8) SE
Destination								
City	0.19	0.13	0.06	(0.05)	0.14	0.12	0.02	(0.04)
Other state	0.29	0.34	-0.05	(0.07)	0.32	0.37	-0.05	(0.05)
Intl	0.59	0.52	0.08	(0.07)	0.49	0.56	-0.06	(0.05)
City, other state or intl	0.76	0.64	0.12*	(0.07)	0.62	0.68	-0.07	(0.05)
Persistence								
Long-term	0.25	0.18	0.08	(0.05)	0.18	0.18	0.00	(0.04)
Short-term	0.75	0.82	-0.08	(0.05)	0.82	0.82	0.00	(0.04)
% of sub-sample	0.10	0.10	–		0.09	0.12	–	
N	59	370	429		226	144	370	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Mean reported for all individual observations. City only available for long-term migration.

Table 11: 2002 Household Endowment Characteristics by Migration

	International Migration				Domestic Migration			
	No	Yes	Summary Statistics		No	Yes	Summary Statistics	
	(1) Mean/Med	(2) Mean/Med	(3) Difference	(4) SE	(5) Mean/Med	(6) Mean/Med	(7) Difference	(8) SE
Land (ha)	4.49	6.71	-2.22	(1.24)	4.95	3.68	1.27	(1.23)
Land ≤5 ha	0.79	0.73	0.06	(0.04)	0.78	0.78	0.00	(0.04)
Land ejido	0.73	0.76	-0.03	(0.04)	0.75	0.66	0.08*	(0.04)
Land private	0.21	0.22	-0.01	(0.04)	0.20	0.28	-0.08*	(0.04)
HH Size	4.45	5.69	-1.25***	(0.21)	4.45	5.66	-1.21***	(0.21)
Labor to land ratio	2.1	2.86	-0.77*	(0.31)	2.14	2.65	-0.51	(0.33)
Head education	3.51	3.13	0.38	(0.33)	3.53	2.99	0.54	(0.33)
Previous migrant	0.40	0.39	0.01	(0.04)	0.38	0.54	-0.16***	(0.04)
Loan	0.20	0.20	-0.01	(0.04)	0.18	0.28	-0.09**	(0.03)
Assets per capita	28898.33	26158.75	2707.50	(5649.41)	30896.38	17800.00	13096.38*	(5720.31)
Land assets per capita	20000.00	17321.43	2500.00	(4580.58)	21666.67	11000.00	10666.67*	(4334.64)
Consumption per capita	420.39	382.96	31.63	(41.17)	424.32	343.44	81.09*	(38.23)
Food consumption per capita	242.4	196.83	43.73*	(21.33)	242.4	201.78	40.62	(20.75)
N	954	206	1060		949	211	1060	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Mean reported for land, land ≤ 5 ha, land ejido, land private, household size, labor-land ratio, head education, prvious migrant, and loan. Median reported for assets per capita, land assets per capita, consumption per capita, and food consumption per capita.

Table 12: 2002 Household Endowment Characteristics by Agricultural Employment

	Ag Self				Ag Wage			
	No	Yes	Summary Statistics		No	Yes	Summary Statistics	
	(1) Mean/Med	(2) Mean/Med	(3) Difference	(4) SE	(5) Mean/Med	(6) Mean/Med	(7) Difference	(8) SE
Land (ha)	3.96	6.65	-2.68**	(0.91)	5.03	3.91	1.12	(1.01)
Land ≤5 ha	0.81	0.70	0.12***	(0.03)	0.76	0.83	-0.07*	(0.03)
Land ejido	0.76	0.69	0.06*	(0.03)	0.75	0.67	0.08*	(0.03)
Land private	0.18	0.28	-0.09***	(0.03)	0.21	0.23	-0.03	(0.03)
HH size	4.47	4.93	-0.46**	(0.16)	4.55	4.82	-0.27	(0.17)
Labor to land ratio	2.26	2.13	0.13	(0.23)	2.14	2.47	-0.33	(0.27)
Head education	3.77	2.78	0.98***	(0.24)	3.57	3.10	0.47	(0.26)
Previous migrant	0.40	0.39	0.01	(0.03)	0.40	0.39	0.01	(0.04)
Loan	0.18	0.23	-0.04	(0.03)	0.19	0.22	-0.04	(0.03)
Assets per capita	26495.76	33583.64	-7625.77	(3936.20)	29941.67	24388.33	5561.67	(4690.29)
Aassets per capita	18533.33	25000.00	-6333.33	(3324.90)	20000.00	15312.50	4375.00	(3734.23)
Consumption per capita	426.28	391.25	37.15	(30.09)	437.13	362.56	74.98*	(31.52)
Food consumption per capita	241.67	226.00	16.00	(15.66)	241.67	219.20	22.80	(16.97)
N	826	334	1060		914	246	1060	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Mean reported for land, land ≤ 5 ha, land ejido, land private, household size, labor-land ratio, head education, prvious migrant, and loan. Median reported for assets per capita, land assets per capita, consumption per capita, and food consumption per capita.

Table 13: 2002 Household Endowment Characteristics by Non-Agricultural Employment

	Non-Ag Self				Non-Ag Wage			
	No	Yes	Summary Statistics		No	Yes	Summary Statistics	
	(1) Mean/Med	(2) Mean/Med	(3) Difference	(4) SE	(5) Mean/Med	(6) Mean/Med	(7) Difference	(8) SE
Land (ha)	4.59	5.33	-0.73	(0.97)	5.3)	3.81	1.50	(0.88)
Land ≤5 ha	0.80	0.73	0.06*	(0.03)	0.75	0.82	-0.07*	(0.03)
Land ejido	0.72	0.77	-0.05	(0.03)	0.74	0.74	0.00	(0.03)
Land private	0.22	0.19	0.03	(0.03)	0.22	0.20	0.01	(0.03)
HH size	4.52	4.88	-0.36*	(0.17)	4.21	5.33	-1.12***	(0.15)
Labor to land ratio	2.04	2.71	-0.66**	(0.26)	2.04	2.62	-0.58*	(0.25)
Head education	3.38	3.71	-0.32	(0.26)	3.05	4.24	-1.20***	(0.23)
Previous migrant	0.39	0.43	-0.04	(0.03)	0.37	0.45	-0.08**	(0.03)
Loan	0.20	0.20	0.00	(0.03)	0.18	0.23	-0.05*	(0.03)
Assets per capita	28250.00	29787.50	-1575.00	(4410.43)	33352.50	19600.00	13680.00**	(4189.75)
Land assets per capita	20000.00	20446.67	-833.33	(3584.78)	25000.00	13750.00	11000.00***	(3155.35)
Consumption per capita	415.64	434.67	-18.25	(31.73)	424.11	407.02	17.07	(28.16)
Cood consumption per capita	238.00	232.00	6.00	(16.67)	244.00	223.27	20.67	(14.95)
N	982	278	1060		768	392	1060	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Mean reported for land, land ≤ 5 ha, land ejido, land private, household size, labor-land ratio, head education, prvious migrant, and loan. Median reported for assets per capita, land assets per capita, consumption per capita, and food consumption per capita.

Table 14: Relative Proportion of Employment Categories (individual level units)

	Relative Proportion	
	(1)	(2)
	2002	2005
Ag Self	0.24	0.25
Ag Wage	0.20	0.19
Non-Ag Self	0.24	0.23
Non-Ag Wage	0.33	0.34
N	3062	2659

Mean reported in all cases.

Table 15: Temperature-Agriculture Mechanism Tests for Migration Outcomes

	Total Temp Spell Interaction	
	(1) ACDE	(2) 95% CI
PANEL A: International Migration		
2002-2003	0.0001	[-0.0051, 0.0054]
2004-2005	0.0002	[-0.0141, 0.0144]
2002-2005	0.0001	[-0.0650, 0.0653]
PANEL B: Domestic Migration		
2002-2003	0.0012	[-0.0118, 0.0142]
2004-2005	0.0007	[-0.0162, 0.0175]
2002-2005	0.0017	[-0.0200, 0.0235]
Upper 2002-2005	0.0021	[-0.0346, 0.0387]

Notes: * p<0.10, ** p<0.05, *** p<0.01. ACDE=Average Controlled Direct Effect coefficient. Bootstrapped confidence intervals (CIs) derived via 1000 iteration of resampling with replacement at the municipality level. Fixed effects for 12 states. The total temperature spell interaction (divided by 100) is defined as the iteraction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 16: Temperature-Agriculture Mechanism Tests for Employment Outcomes

	Total Temp Spell Interaction	
	(1)	(2)
	ACDE	95% CI
PANEL A: Ag Self		
2002	0.0033	[-0.0143, 0.0209]
2005	0.0027	[-0.0216, 0.0270]
PANEL B: Ag Wage		
2002	-0.0058	[-0.0354, 0.0239]
2005	-0.0034	[-0.0719, 0.0650]
PANEL C: Non-Ag Self		
2002	-0.0006	[-0.0174, 0.0162]
2005	-0.0001	[-0.0885, 0.0883]
PANEL D: Non-Ag Wage		
2002	0.0031	[-0.0309, 0.0372]
2005	0.0008	[-0.0330, 0.0346]

Notes: * p<0.10, ** p<0.05, *** p<0.01. ACDE=Average Controlled Direct Effect coefficient. Bootstrapped confidence intervals (CIs) derived via 1000 iteration of resampling with replacement at the municipality level. Fixed effects for 12 states. The total temperature spell interaction (divided by 100) is defined as the iteraction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Figure 3: Summary of *Ex Ante* Migration Estimates

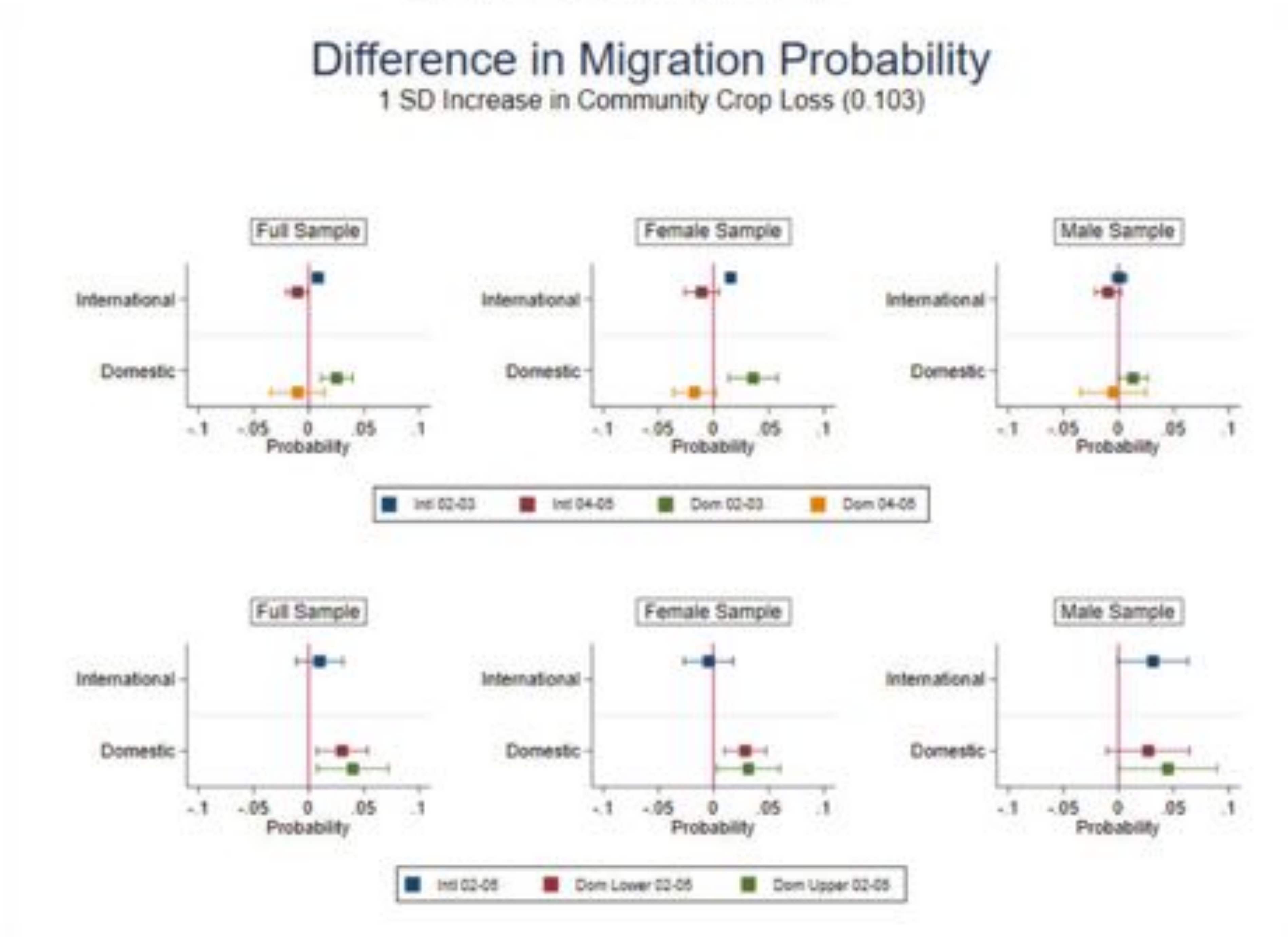


Figure 4: Summary of *Ex Ante* Employment Estimates

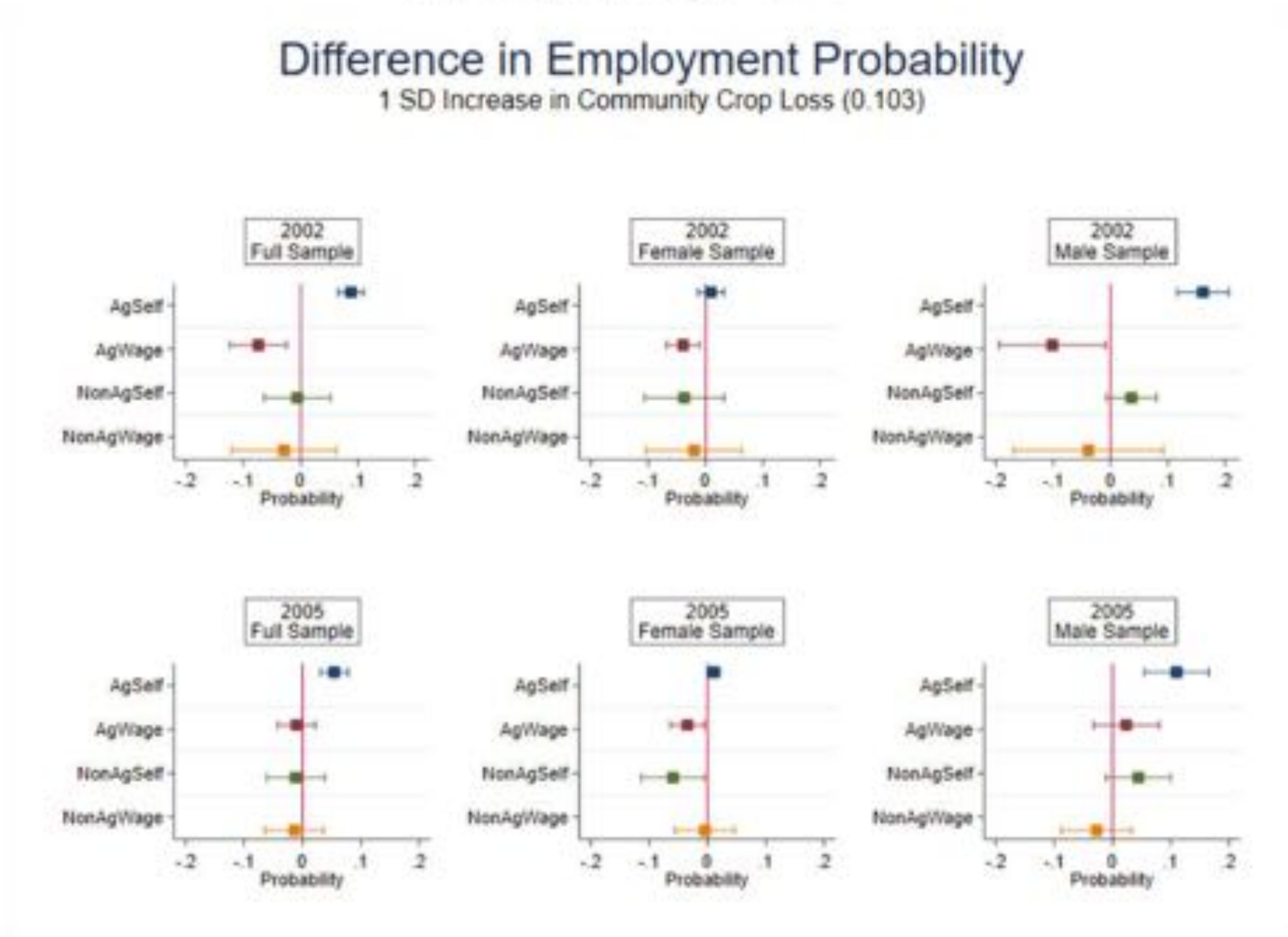


Table 17: Comparison of *Ex Ante* & *Ex Post* Migration Estimates [IV 2nd-Stage]

	Crop Loss Coefficients		Summary Statistics	
	(1) Ex Ante	(2) Ex Post	(3) Ratio	(4) Share
PANEL A: International Migration				
2002-2003	0.008***	0.017***	0.474	0.322
	(0.002)	(0.005)		
2004-2005	-0.010**	-0.026**	0.394	0.283
	(0.005)	(0.011)		
2002-2005	0.010	0.032	0.305	0.234
	(0.011)	(0.028)		
PANEL B: Domestic Migration				
2002-2003	0.026***	0.051***	0.510	0.339
	(0.007)	(0.019)		
2004-2005	-0.010	-0.031	0.326	0.246
	(0.012)	(0.030)		
2002-2005	0.031**	0.052	0.597	0.374
	(0.012)	(0.033)		
Upper 2002-2005	0.041***	0.076	0.533	0.348
	(0.017)	(0.047)		

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. The ex ante crop loss coefficient is based on the community crop loss variable, which is the proportion of other households in the community reporting catastrophic crop loss. The ex post crop loss coefficient is based on the binary household crop loss variable. The ratio is the ex ante coefficient relative to the ex post coefficient. The share is the relative contribution of the ex ante coefficient relative to the sum of the ex ante and ex post coefficients, i.e. the total. Crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the iteraction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 18: Comparison of *Ex Ante* & *Ex Post* Employment Estimates [IV 2nd-Stage]

	Crop Loss Coefficients		Summary Statistics	
	(1) Ex Ante	(2) Ex Post	(3) Ratio	(4) Share
PANEL A: Ag Self				
2002	0.088***	0.199***	0.441	0.306
	(0.012)	(0.035)		
2005	0.055***	0.150**	0.370	0.270
	(0.013)	(0.063)		
PANEL B: Ag Wage				
2002	-0.073***	-0.130**	0.564	0.361
	(0.025)	(0.055)		
2005	-0.009	-0.035	0.250	0.200
	(0.017)	(0.052)		
PANEL C: Non-Ag Self				
2002	-0.006	-0.059	0.099	0.090
	(0.029)	(0.050)		
2005	-0.012	-0.077	0.158	0.136
	(0.025)	(0.059)		
PANEL D: Non-Ag Wage				
2002	-0.030	-0.058	0.506	0.336
	(0.047)	(0.093)		
2005	-0.015	-0.036	0.429	0.300
	(0.025)	(0.082)		

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. The ex ante crop loss coefficient is based on the community crop loss variable, which is the proportion of other households in the community reporting catastrophic crop loss. The ex post crop loss coefficient is based on the binary household crop loss variable. The ratio is the ex ante coefficient relative to the ex post coefficient. The share is the relative contribution of the ex ante coefficient relative to the sum of the ex ante and ex post coefficients, i.e. the total. Crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the iteraction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 19: Comparison of State & Region Fix Effects for *Ex Ante* Migration Estimates

	Crop Loss Coefficents	
	(1)	(2)
	State FE	Region FE
PANEL A: International Migration		
2002-2003	0.0081***	0.0078***
	(0.002)	(0.002)
First stage F-stat (MP)	73	26
2004-2005	-0.0098**	-0.0092
	(0.005)	(0.007)
First stage F-stat (MP)	73	26
2002-2005	0.0097	0.0037
	(0.010)	(0.021)
First stage F-stat (MP)	74	26
PANEL B: Domestic Migration		
2002-2003	0.0249***	0.0248***
	(0.007)	(0.008)
First stage F-stat (MP)	73	26
2004-2005	-0.0097	-0.0047
	(0.012)	(0.008)
First stage F-stat (MP)	73	26
2002-2005	0.0296***	0.0281**
	(0.011)	(0.012)
First stage F-stat (MP)	73	26
Upper 2002-2005	0.0390**	0.0105
	(0.016)	(0.017)
First stage F-stat (MP)	75	26

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states or 5 regions. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Table 20: Comparison of State & Region Fix Effects for *Ex Ante* Employment Estimates

	Crop Loss Coefficents	
	(1) State FE	(2) Region FE
PANEL A: Ag Self		
2002	0.0854***	0.0511**
	(0.011)	(0.020)
First stage F-stat (MP)	120	54
2005	0.0528***	0.0375*
	(0.012)	(0.022)
First stage F-stat (MP)	73	27
PANEL B: Ag Wage		
2002	-0.0716***	0.0042
	(0.025)	(0.020)
First stage F-stat (MP)	120	54
2005	-0.0100	0.0375*
	(0.016)	(0.022)
First stage F-stat (MP)	73	27
PANEL C: Non-Ag Self		
2002	-0.0057	-0.0048
	(0.029)	(0.029)
First stage F-stat (MP)	120	54
2005	-0.0114	-0.0198
	(0.025)	(0.038)
First stage F-stat (MP)	74	27
PANEL D: Non-Ag Wage		
2002	-0.0282	-0.0556
	(0.045)	(0.038)
First stage F-stat (MP)	120	54
2005	-0.0137	-0.0231
	(0.025)	(0.039)
First stage F-stat (MP)	75	27

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states or 5 regions. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Olea & Pflueger. Controlling for (i) Individual covariates: age, sex, marital or informal union, years of education, student or any employment status; (ii) HH covariates: land size, ejido land, other land, HH size, # adult females, # adult males, head age, head education, migration history, access to loan, piped water & toilet; (iii) Community covariates: % of agricultural employment, bus stop, hospital, secondary school & market; & (iv) Municipality covariates: % land irrigated, % land maize, population, economic diversity & migration intensity.

Figure 5: Sensitivity of International Migration Estimates to Strength of Signal

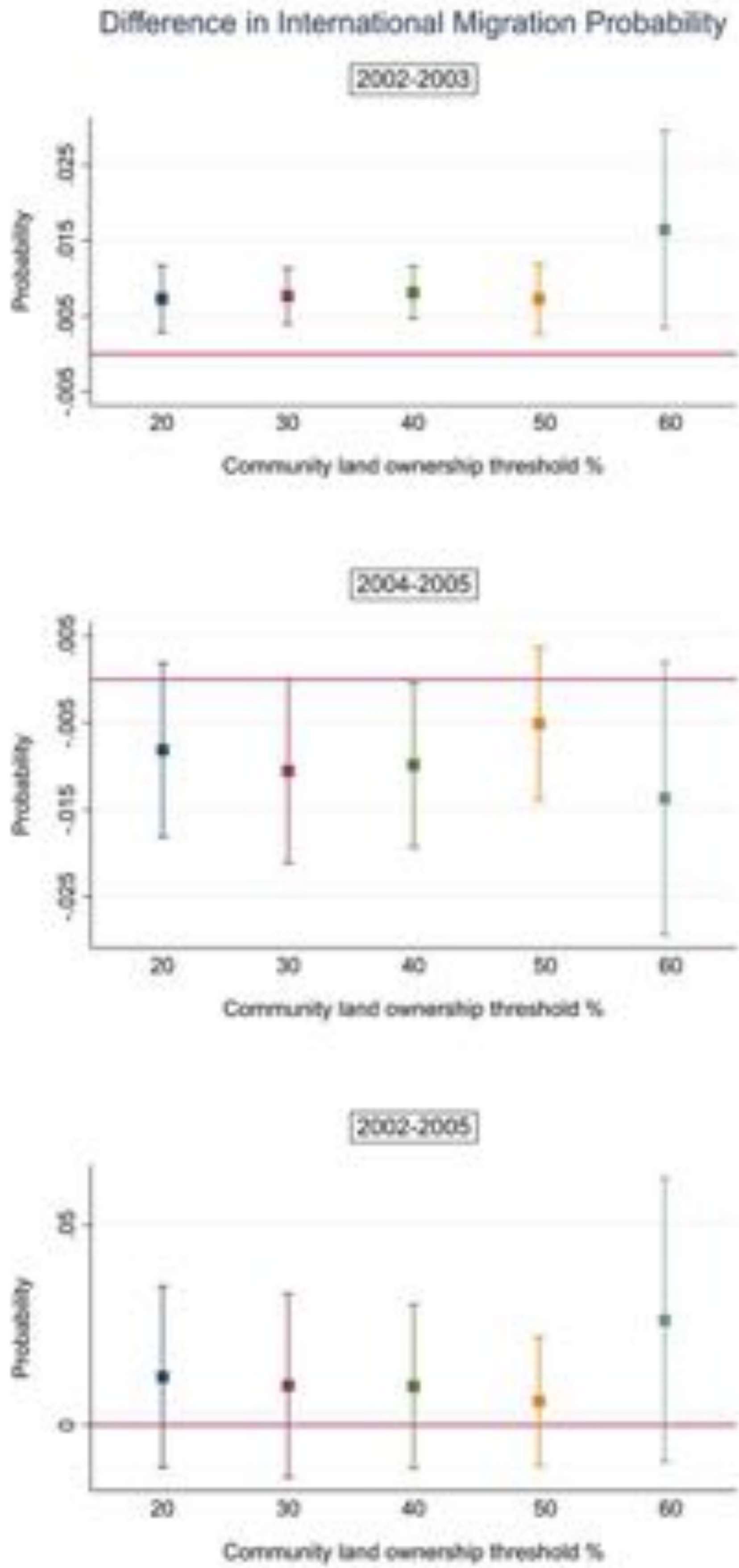


Figure 6: Sensitivity of Domestic Migration Estimates to Strength of Signal

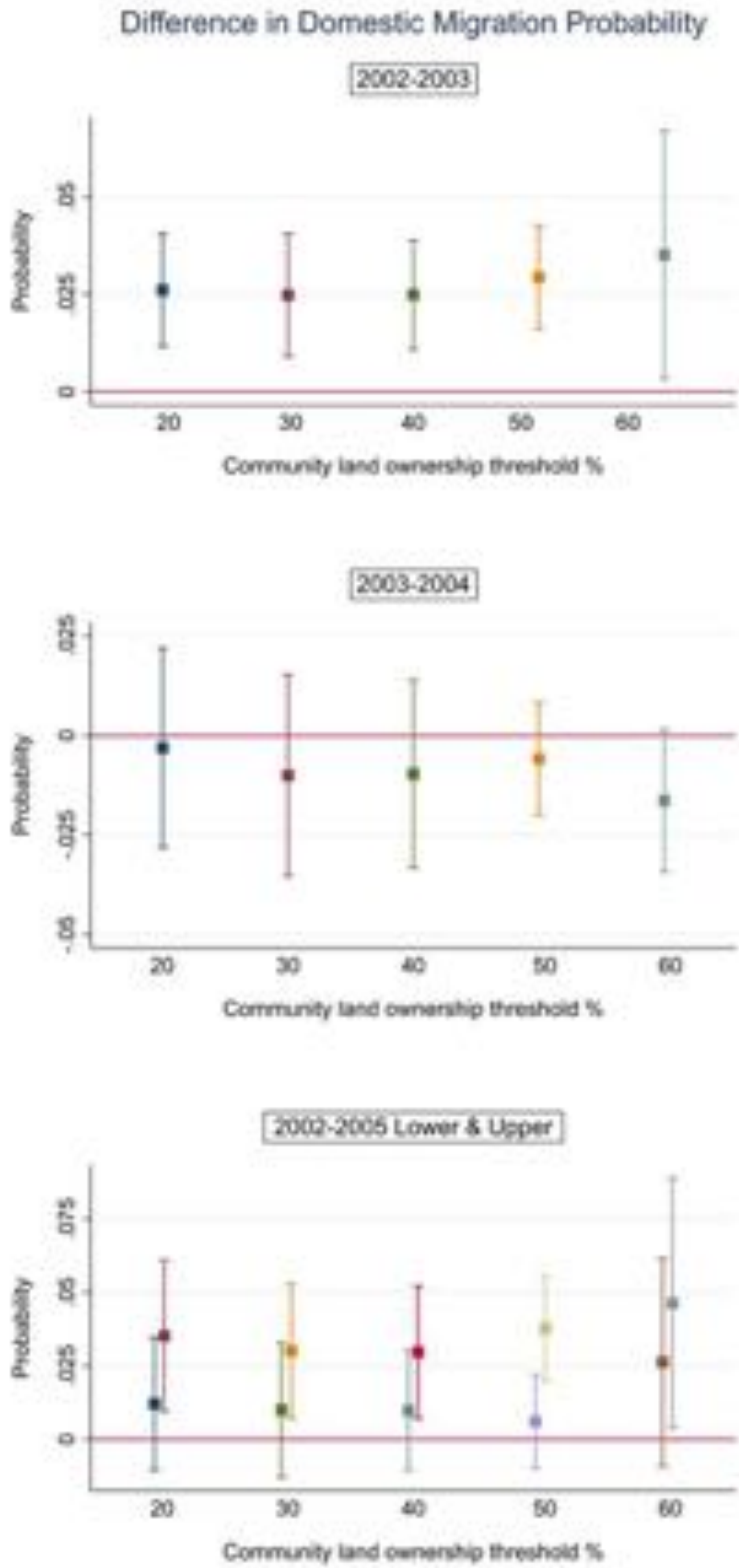


Figure 7: Sensitivity of Agricultural Self-Employment Estimates to Strength of Signal

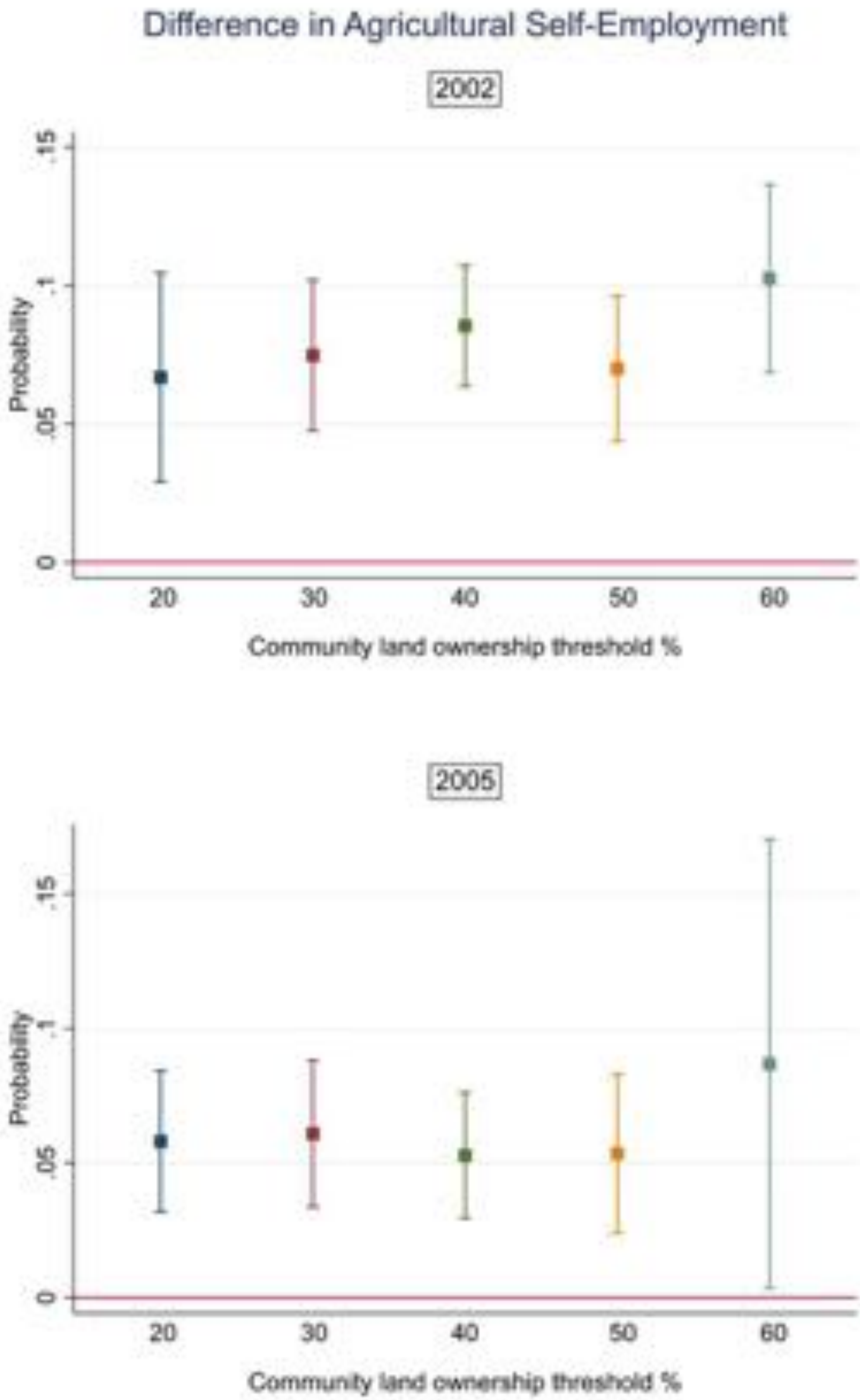


Figure 8: Sensitivity of Agricultural Wage Estimates to Strength of Signal

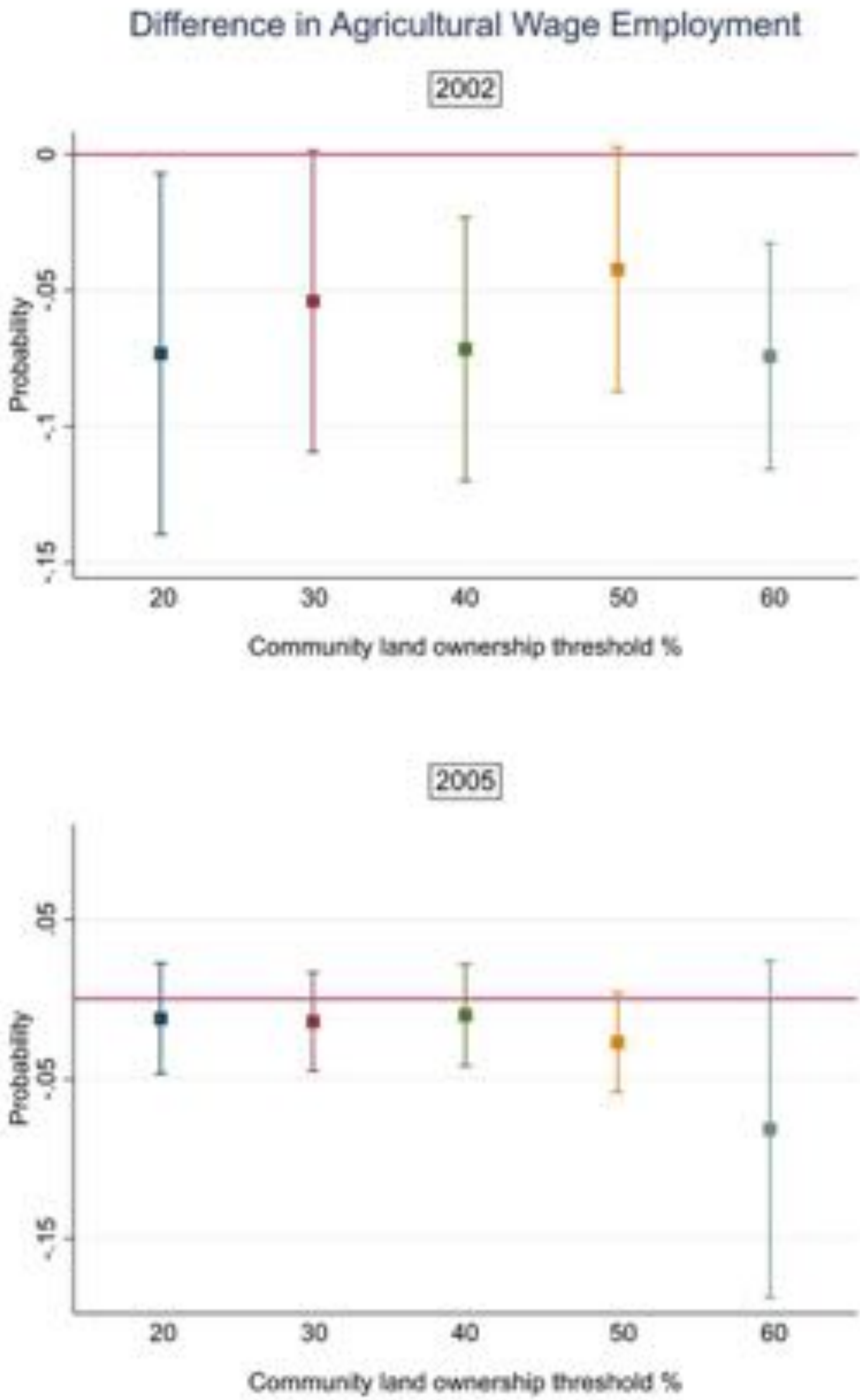
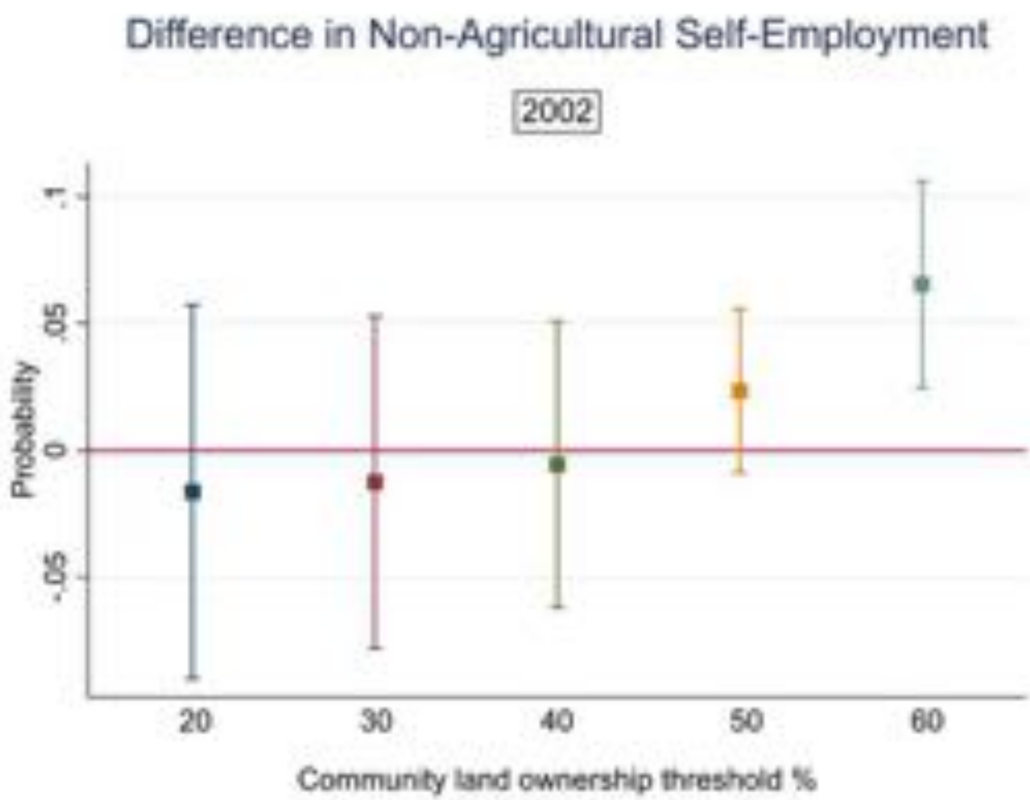


Figure 9: Sensitivity of Non-Agricultural Self-Employment Estimates to Strength of Signal



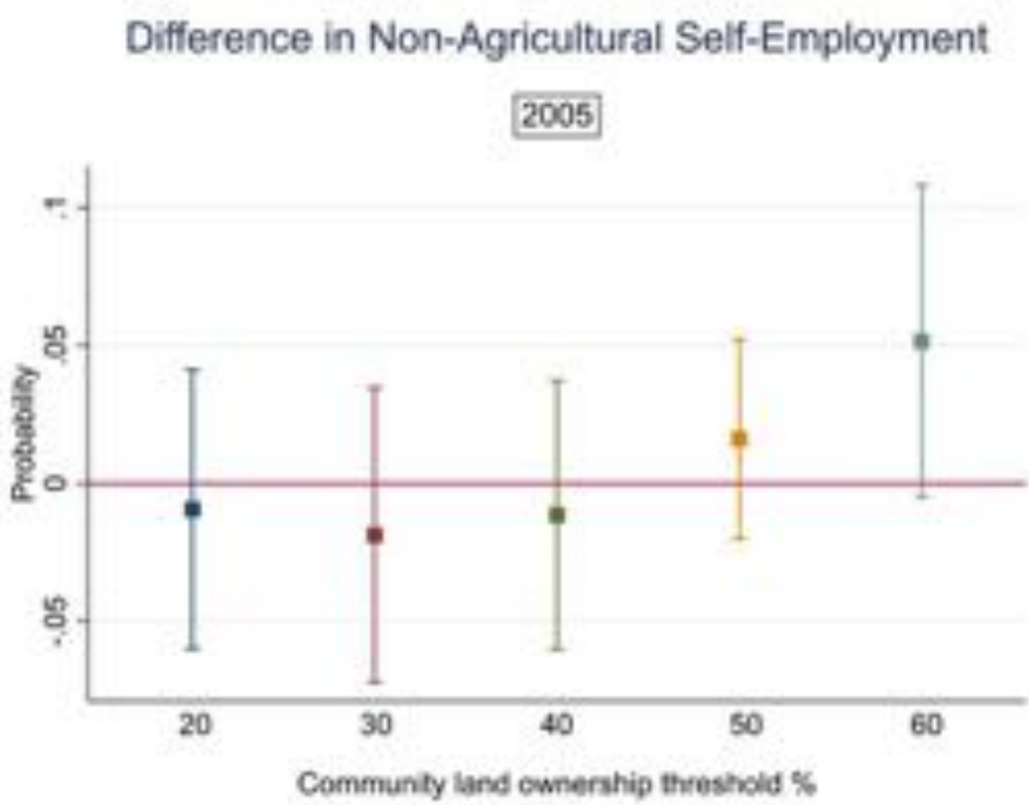
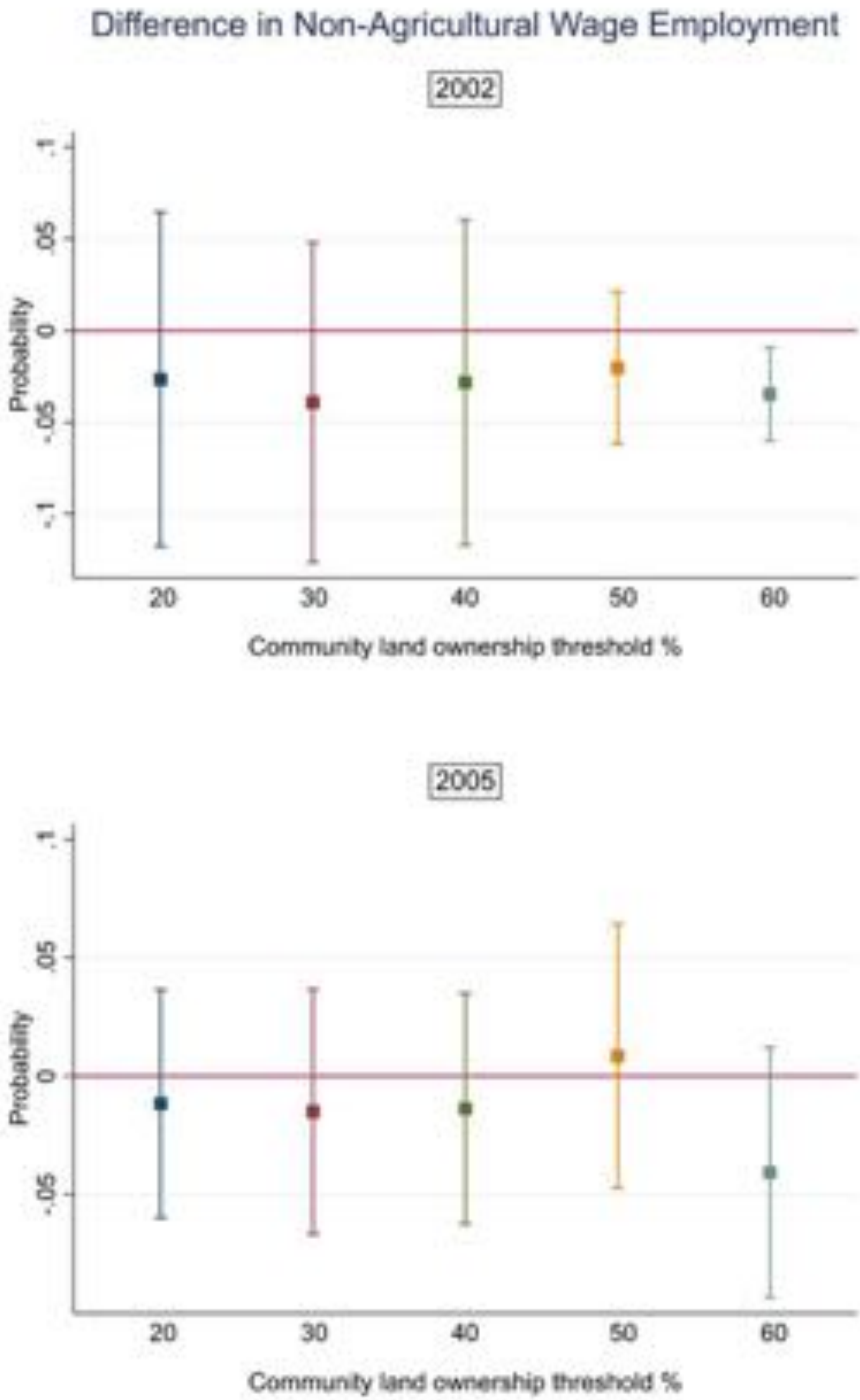


Figure 10: Sensitivity of Non-Agricultural Wage Estimates to Strength of Signal



12. Appendix

Figure A1: Distribution ofAgricultural Engagement at the Community-level

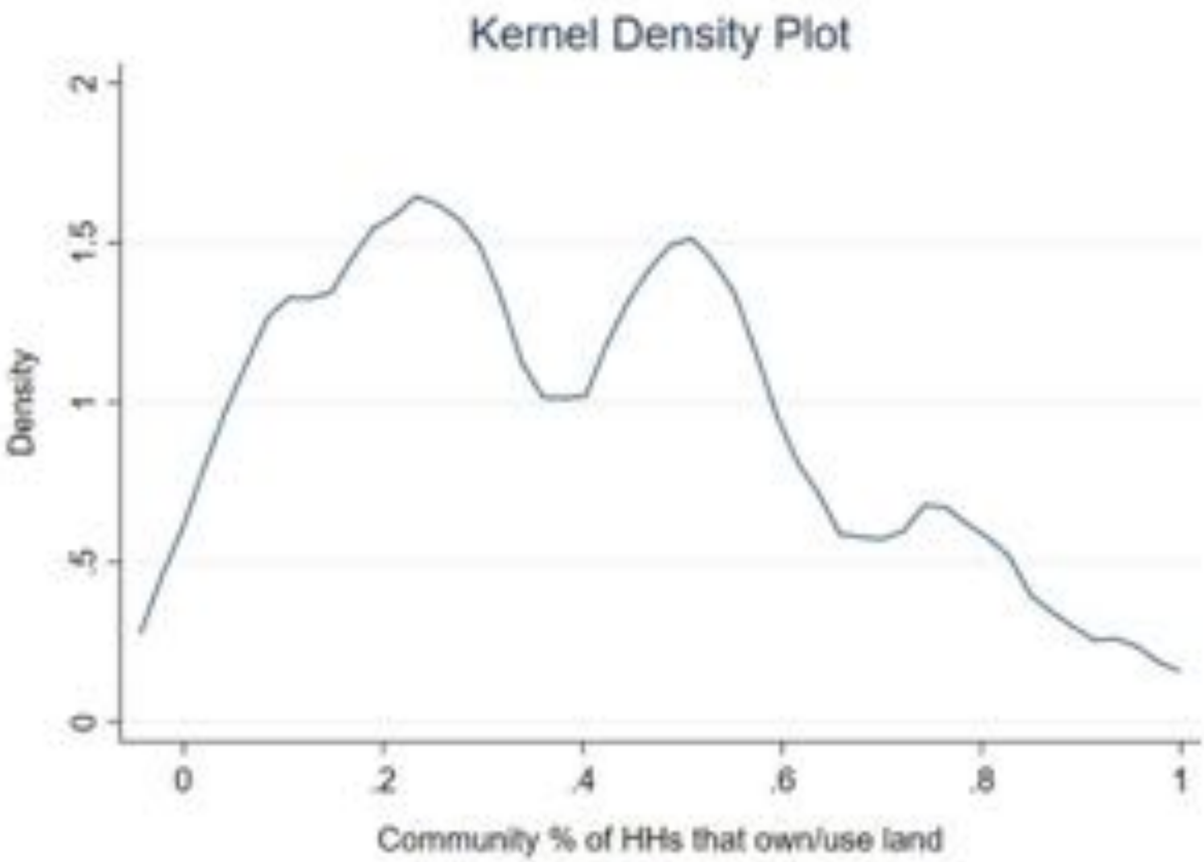
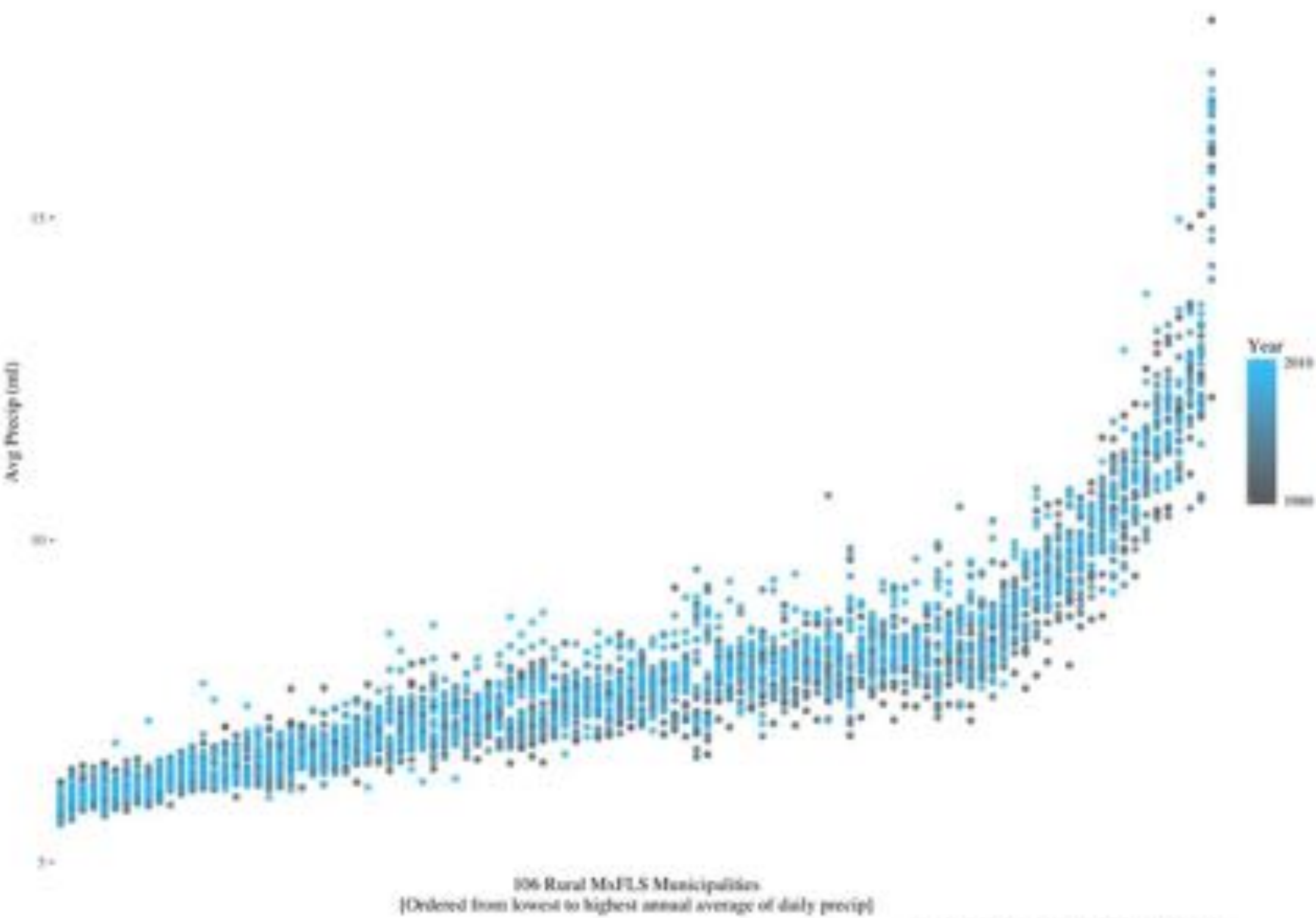


Figure A2

Rural MxFLS Municipalities: Annual Average of Daily Precipitation in Mexico from 1980-2010

[Each vertical column depicts a rural MxFLS municipality over time]



Source: Daily data from AgMERRA (NASA)

Figure A3: Distribution of Catastrophic Crop Shocks at the Community-level

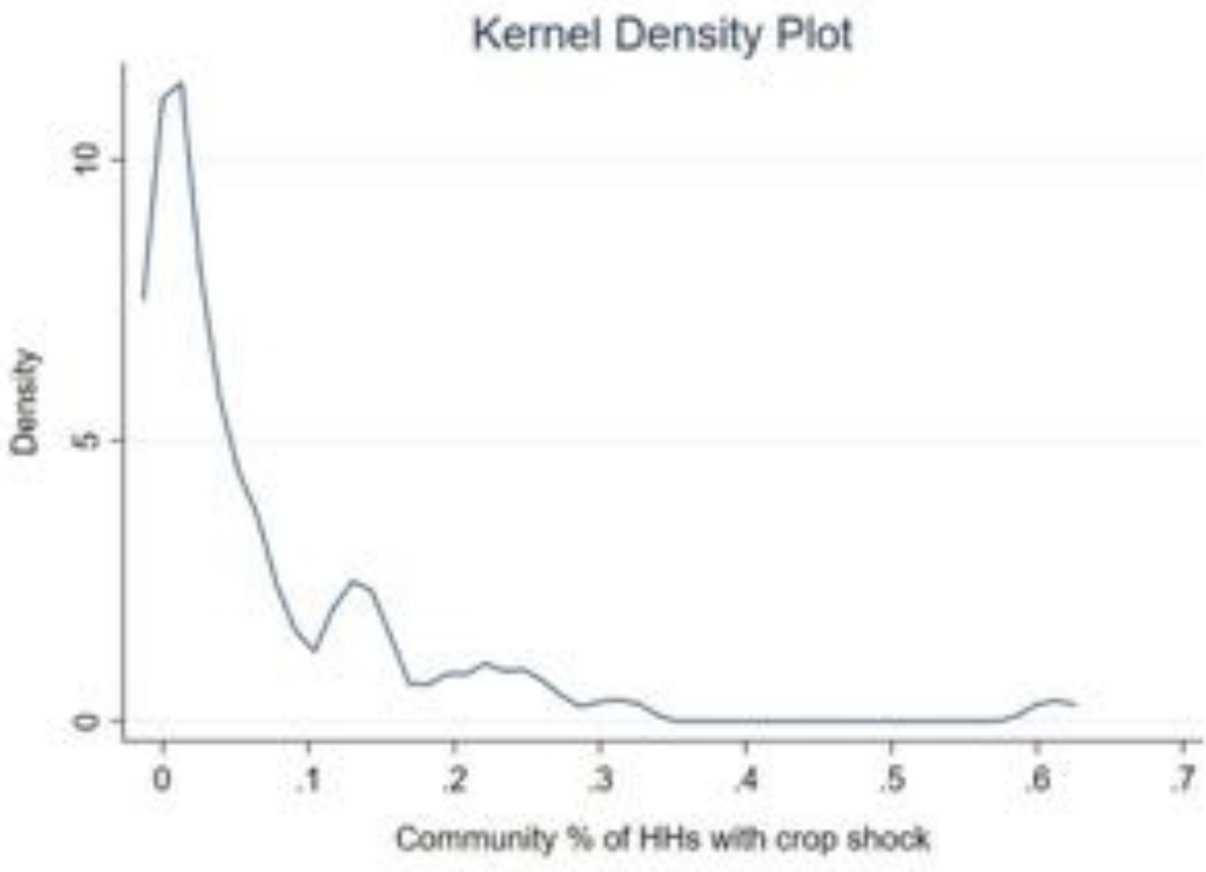


Table A1: Mean of Additional Control Variables (individual level units)

	(1) Mean	(2) SD
Age	40.61	19.33
Male	0.49	0.50
Union	0.60	0.49
Years of education	4.94	3.99
Student	0.08	0.27
HH piped water	0.83	0.37
HH toilet	0.39	0.49
HH head age	53.26	14.44
HH head education	3.42	3.47
HH loan	0.22	0.42
N	3343	

Table A2: Comm. Crop Loss Outcomes for *Ex Ante* 2002-2003 & 2004-2005 Migration [IV-1st Stage]

	Migration			
	2002-2003		2004-2005	
	(1) Intl	(2) Domestic	(3) Intl	(4) Domestic
Temp total spell interaction (00-02)	0.052***	0.053***	0.052***	0.053***
	(0.006)	(0.006)	(0.006)	(0.006)
HH land (ha)	0.003	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
HH ejido	-0.340***	-0.341***	-0.340***	-0.340***
	(0.124)	(0.124)	(0.124)	(0.124)
HH land other	-0.213**	-0.213**	-0.213**	-0.214**
	(0.092)	(0.092)	(0.092)	(0.092)
Age	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.005	0.005	0.005	0.005
	(0.007)	(0.007)	(0.007)	(0.007)
Union	0.023	0.023	0.023	0.023
	(0.025)	(0.025)	(0.025)	(0.025)
Years of education	0.003	0.003	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.005)
Student	0.068	0.068	0.068	0.067
	(0.049)	(0.049)	(0.049)	(0.049)
Intl migrant (02-03)			-0.010	
			(0.216)	
Domestic migrant (02-03)				-0.030
				(0.045)
HH size	0.001	0.001	0.001	0.001
	(0.008)	(0.008)	(0.008)	(0.008)
HH # adult females	-0.019	-0.019	-0.019	-0.018
	(0.036)	(0.036)	(0.036)	(0.036)
HH # adult males	0.015	0.015	0.015	0.015
	(0.026)	(0.026)	(0.026)	(0.026)
HH head age	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.003	-0.003	-0.003	-0.003
	(0.006)	(0.006)	(0.006)	(0.006)
HH previous migrant	-0.120**	-0.121**	-0.120**	-0.120**
	(0.050)	(0.050)	(0.050)	(0.050)
HH loan	-0.100**	-0.109**	-0.100**	-0.100**
	(0.047)	(0.046)	(0.047)	(0.047)
HH piped water	0.135	0.135	0.134	0.134
	(0.120)	(0.119)	(0.120)	(0.120)
HH toilet	-0.167**	-0.168**	-0.167**	-0.167**
	(0.077)	(0.077)	(0.077)	(0.077)
Com ag employment proportion	1.768	1.758	1.768	1.771
	(2.208)	(2.206)	(2.210)	(2.209)
Com bus stop	0.139	0.140	0.140	0.139
	(0.292)	(0.292)	(0.292)	(0.292)
Com hospital	0.193	0.191	0.193	0.194
	(0.457)	(0.457)	(0.457)	(0.458)
Com secondary school	-0.389	-0.389	-0.389	-0.389
	(0.317)	(0.317)	(0.317)	(0.317)
Com market	0.062	0.064	0.062	0.061
	(0.302)	(0.302)	(0.302)	(0.302)
Mun % land irrigated	-0.019**	-0.019**	-0.014**	-0.014**
	(0.007)	(0.007)	(0.007)	(0.007)
Mun % land with maize	-0.008	-0.008	-0.008	-0.008
	(0.015)	(0.015)	(0.015)	(0.015)
Mun % land with coffee	-0.025	-0.025	-0.025	-0.025
	(0.036)	(0.036)	(0.036)	(0.036)
Mun % land with wheat	-0.015	-0.015	-0.015	-0.015
	(0.027)	(0.027)	(0.027)	(0.027)
Mun population (10,000s of individuals)	0.005	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)	(0.005)
Mun economic diversity	-1.407*	-1.412*	-1.407*	-1.407*
	(0.841)	(0.842)	(0.842)	(0.841)
Mun marginalization index	-0.095	-0.096	-0.095	-0.095
	(0.298)	(0.298)	(0.298)	(0.298)
Mun migration intensity	-0.309	-0.308	-0.309	-0.308
	(0.190)	(0.190)	(0.191)	(0.190)
State FE	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	73	74	73	73
First stage *F*-stat (KP)	71	72	72	72
First stage *F*-stat (CD)	358	358	359	359
N	2908	2910	2908	2909
Mean of outcome variable	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 13 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (32C) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A3: Comm. Crop Loss Outcomes for *Ex Ante* Female & Male 2002-2003 & 2004-2005 Migration [IV-1st Stage]

	Female Migration				Male Migration			
	2002-2003		2004-2005		2002-2003		2004-2005	
	(1) Int'l	(2) Domestic	(3) Int'l	(4) Domestic	(5) Int'l	(6) Domestic	(7) Int'l	(8) Domestic
Temp total spell interaction (00-02)	0.053***	0.053***	0.053***	0.053***	0.052***	0.052***	0.052***	0.052***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
HH land (ha)	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HH ejido	-0.350***	-0.324***	-0.317***	-0.336***	-0.318***	-0.318***	-0.318***	-0.314***
	(0.133)	(0.133)	(0.133)	(0.133)	(0.122)	(0.122)	(0.122)	(0.122)
HH land other	-0.212**	-0.212**	-0.213**	-0.212**	-0.213**	-0.213**	-0.214**	-0.213**
	(0.087)	(0.087)	(0.087)	(0.087)	(0.090)	(0.090)	(0.090)	(0.090)
Age	0.000	0.000	0.000	0.000	0.002*	0.002*	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	0.049*	0.048*	0.049*	0.050*	-0.018	-0.017	-0.018	-0.020
	(0.028)	(0.028)	(0.027)	(0.027)	(0.030)	(0.030)	(0.030)	(0.030)
Years of education	0.003	0.003	0.003	0.003	0.007	0.007	0.007	0.007
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
Student	0.043	0.048	0.043	0.043	0.098	0.098	0.098	0.094
	(0.051)	(0.051)	(0.051)	(0.050)	(0.064)	(0.064)	(0.064)	(0.063)
Int'l migrant (02-03)			0.299				-0.140	
			(0.304)				(0.217)	
Domestic migrant (02-03)				0.041				-0.131
				(0.058)				(0.099)
HH size	-0.003	-0.003	-0.003	-0.003	0.005	0.005	0.005	0.005
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
HH # adult females	-0.004	-0.003	-0.003	-0.004	-0.034	-0.034	-0.034	-0.034
	(0.036)	(0.036)	(0.036)	(0.036)	(0.043)	(0.043)	(0.043)	(0.043)
HH # adult males	0.022	0.022	0.022	0.022	0.004	0.004	0.004	0.005
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
HH head age	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.002	-0.002	-0.002	-0.002	-0.006	-0.006	-0.006	-0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
HH previous migrant	-0.128**	-0.129**	-0.128**	-0.129**	-0.112**	-0.110**	-0.112**	-0.108**
	(0.053)	(0.053)	(0.053)	(0.053)	(0.047)	(0.047)	(0.047)	(0.047)
HH loan	-0.073*	-0.072*	-0.074*	-0.073*	-0.140**	-0.140**	-0.140**	-0.139**
	(0.040)	(0.039)	(0.040)	(0.039)	(0.061)	(0.061)	(0.062)	(0.061)
HH piped water	0.160	0.159	0.159	0.159	0.106	0.106	0.107	0.107
	(0.117)	(0.117)	(0.117)	(0.116)	(0.125)	(0.124)	(0.125)	(0.125)
HH toilet	-0.182**	-0.182**	-0.182**	-0.182**	-0.149**	-0.149**	-0.149**	-0.147**
	(0.081)	(0.081)	(0.081)	(0.081)	(0.074)	(0.074)	(0.074)	(0.074)
Com ag employment proportion	1.659	1.635	1.656	1.657	1.902	1.901	1.909	1.926
	(2.294)	(2.290)	(2.297)	(2.294)	(2.150)	(2.156)	(2.160)	(2.163)
Com bus stop	0.164	0.165	0.164	0.165	0.118	0.118	0.118	0.115
	(0.282)	(0.282)	(0.282)	(0.282)	(0.303)	(0.303)	(0.303)	(0.303)
Com hospital	0.241	0.238	0.236	0.239	0.153	0.151	0.152	0.136
	(0.456)	(0.453)	(0.455)	(0.457)	(0.480)	(0.470)	(0.470)	(0.470)
Com secondary school	-0.411	-0.410	-0.413	-0.413	-0.367	-0.367	-0.368	-0.370
	(0.317)	(0.317)	(0.317)	(0.317)	(0.323)	(0.323)	(0.322)	(0.325)
Com market	0.086	0.089	0.087	0.087	0.036	0.036	0.038	0.032
	(0.306)	(0.306)	(0.307)	(0.306)	(0.299)	(0.299)	(0.299)	(0.299)
Mun % land irrigated	-0.017***	-0.017***	-0.017***	-0.017***	-0.018**	-0.018**	-0.018**	-0.019**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Mun % land with maize	-0.007	-0.007	-0.007	-0.007	-0.010	-0.010	-0.010	-0.010
	(0.013)	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.015)	(0.015)
Mun % land with coffee	-0.026	-0.026	-0.026	-0.026	-0.024	-0.024	-0.024	-0.024
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Mun % land with wheat	-0.017	-0.017	-0.017	-0.017	-0.013	-0.013	-0.013	-0.013
	(0.027)	(0.027)	(0.027)	(0.027)	(0.029)	(0.029)	(0.029)	(0.029)
Mun population (10,000s of individuals)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Mun economic diversity	-1.518*	-1.529*	-1.520*	-1.518*	-1.277	-1.277	-1.273	-1.280
	(0.862)	(0.862)	(0.863)	(0.862)	(0.831)	(0.831)	(0.832)	(0.829)
Mun marginalization index	-0.080	-0.082	-0.080	-0.080	-0.112	-0.112	-0.111	-0.114
	(0.294)	(0.294)	(0.294)	(0.293)	(0.305)	(0.305)	(0.305)	(0.305)
Mun migration intensity	-0.307*	-0.305*	-0.306*	-0.307*	-0.311	-0.310	-0.311	-0.313
	(0.182)	(0.182)	(0.182)	(0.182)	(0.203)	(0.202)	(0.203)	(0.202)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	78	79	78	79	66	65	66	66
First stage F-stat (KP)	77	77	77	77	64	64	64	65
First stage F-stat (CD)	176	175	176	175	178	178	179	179
N	1518	1517	1518	1516	1302	1303	1302	1302
Mean of outcome variable	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A4: Community Crop Loss Outcomes for *Ex Ante* 2002 Employment [IV-1st Stage]

	Ag Self	Ag Wage	Non-Ag Self	Non-Ag Wage
	(1)	(2)	(3)	(4)
Temp total spell interaction (00-02)	0.053***	0.053***	0.053***	0.053***
	(0.005)	(0.005)	(0.005)	(0.005)
HH land (ha)	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
HH land ejido	-0.350***	-0.350***	-0.350***	-0.350***
	(0.134)	(0.134)	(0.134)	(0.134)
HH land other	-0.193**	-0.193**	-0.193**	-0.193**
	(0.082)	(0.082)	(0.082)	(0.082)
Age	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.000	0.000	0.000	0.000
	(0.009)	(0.009)	(0.009)	(0.009)
Union	0.019	0.019	0.019	0.019
	(0.026)	(0.026)	(0.026)	(0.026)
Years of education	0.002	0.002	0.002	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Student	0.073	0.073	0.073	0.073
	(0.048)	(0.048)	(0.048)	(0.048)
HH size	-0.002	-0.002	-0.002	-0.002
	(0.008)	(0.008)	(0.008)	(0.008)
HH # adult females	-0.029	-0.029	-0.029	-0.029
	(0.053)	(0.053)	(0.053)	(0.053)
HH # adult males	0.013	0.013	0.013	0.013
	(0.028)	(0.028)	(0.028)	(0.028)
HH head age	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
HH head education	-0.004	-0.004	-0.004	-0.004
	(0.006)	(0.006)	(0.006)	(0.006)
HH previous migrant	-0.126**	-0.126**	-0.126**	-0.126**
	(0.052)	(0.052)	(0.052)	(0.052)
HH loan	-0.109**	-0.109**	-0.109**	-0.109**
	(0.046)	(0.046)	(0.046)	(0.046)
HH piped water	0.085	0.085	0.085	0.085
	(0.087)	(0.087)	(0.087)	(0.087)
HH toilet	-0.162**	-0.162**	-0.162**	-0.162**
	(0.078)	(0.078)	(0.078)	(0.078)
Com bus stop	0.166	0.166	0.166	0.166
	(0.295)	(0.295)	(0.295)	(0.295)
Com hospital	0.233	0.233	0.233	0.233
	(0.408)	(0.408)	(0.408)	(0.408)
Com secondary school	-0.273	-0.273	-0.273	-0.273
	(0.263)	(0.263)	(0.263)	(0.263)
Com market	0.177	0.177	0.177	0.177
	(0.242)	(0.242)	(0.242)	(0.242)
Mun % land irrigated	-0.016***	-0.016***	-0.016***	-0.016***
	(0.006)	(0.006)	(0.006)	(0.006)
Mun % land with maize	-0.008	-0.008	-0.008	-0.008
	(0.015)	(0.015)	(0.015)	(0.015)
Mun % land with coffee	-0.021	-0.021	-0.021	-0.021
	(0.016)	(0.016)	(0.016)	(0.016)
Mun % land with wheat	-0.003	-0.003	-0.003	-0.003
	(0.023)	(0.023)	(0.023)	(0.023)
Mun population (10,000s of individuals)	0.006	0.006	0.006	0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Mun economic diversity	-1.898***	-1.898***	-1.898***	-1.898***
	(0.567)	(0.567)	(0.567)	(0.567)
Mun marginalization index	-0.151	-0.151	-0.151	-0.151
	(0.286)	(0.286)	(0.286)	(0.286)
Mun migration intensity	-0.244	-0.244	-0.244	-0.244
	(0.166)	(0.166)	(0.166)	(0.166)
State FE	Yes	Yes	Yes	Yes
First stage F-stat (MP)	114	114	114	114
First stage F-stat (KP)	112	112	112	112
First stage F-stat (CD)	388	388	388	388
N	2962	2962	2962	2962
Mean of outcome	0.08	0.08	0.08	0.08

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +(20) (deviations) and the total # of days for the max spell where the daily temp > 30 (DD?) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A5: Community Crop Loss Outcomes for *Ex Ante* Female & Male 2002 Employment [IV-1st Stage]

	Female Employment				Male Employment			
	(1) Ag Self	(2) Ag Wage	(3) Non-Ag Self	(4) Non-Ag Wage	(5) Ag Self	(6) Ag Wage	(7) Non-Ag Self	(8) Non-Ag Wage
Temp total spell interaction (00-02)	0.053***	0.053***	0.053***	0.053***	0.052***	0.052***	0.052***	0.052***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
HH land (ha)	0.004***	0.004***	0.004***	0.004***	0.003**	0.003**	0.003**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH land ejido	-0.364**	-0.364**	-0.364**	-0.364**	-0.329**	-0.329**	-0.329**	-0.329**
	(0.142)	(0.142)	(0.142)	(0.142)	(0.133)	(0.133)	(0.133)	(0.133)
HH land other	-0.197**	-0.197**	-0.197**	-0.197**	-0.167**	-0.167**	-0.167**	-0.167**
	(0.080)	(0.080)	(0.080)	(0.080)	(0.078)	(0.078)	(0.078)	(0.078)
Age	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	0.042	0.042	0.042	0.042	-0.017	-0.017	-0.017	-0.017
	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)
Years of education	0.002	0.002	0.002	0.002	0.006	0.006	0.006	0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Student	0.048	0.048	0.048	0.048	0.088	0.088	0.088	0.088
	(0.057)	(0.057)	(0.057)	(0.057)	(0.059)	(0.059)	(0.059)	(0.059)
HH size	-0.004	-0.004	-0.004	-0.004	0.000	0.000	0.000	0.000
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
HH # adult females	-0.015	-0.015	-0.015	-0.015	-0.042	-0.042	-0.042	-0.042
	(0.051)	(0.051)	(0.051)	(0.051)	(0.056)	(0.056)	(0.056)	(0.056)
HH # adult males	0.019	0.019	0.019	0.019	0.003	0.003	0.003	0.003
	(0.030)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)
HH head age	-0.000	-0.000	-0.000	-0.000	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.003	-0.003	-0.003	-0.003	-0.008	-0.008	-0.008	-0.008
	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
HH previous migrant	-0.135**	-0.135**	-0.135**	-0.135**	-0.115**	-0.115**	-0.115**	-0.115**
	(0.055)	(0.055)	(0.055)	(0.055)	(0.050)	(0.050)	(0.050)	(0.050)
HH loan	-0.075*	-0.075*	-0.075*	-0.075*	-0.145**	-0.145**	-0.145**	-0.145**
	(0.041)	(0.041)	(0.041)	(0.041)	(0.059)	(0.059)	(0.059)	(0.059)
HH piped water	0.115	0.115	0.115	0.115	0.054	0.054	0.054	0.054
	(0.095)	(0.095)	(0.095)	(0.095)	(0.101)	(0.101)	(0.101)	(0.101)
HH toilet	-0.180**	-0.180**	-0.180**	-0.180**	-0.141*	-0.141*	-0.141*	-0.141*
	(0.083)	(0.083)	(0.083)	(0.083)	(0.073)	(0.073)	(0.073)	(0.073)
Com bus stop	0.186	0.186	0.186	0.186	0.145	0.145	0.145	0.145
	(0.285)	(0.285)	(0.285)	(0.285)	(0.307)	(0.307)	(0.307)	(0.307)
Com hospital	0.277	0.277	0.277	0.277	0.201	0.201	0.201	0.201
	(0.407)	(0.407)	(0.407)	(0.407)	(0.418)	(0.418)	(0.418)	(0.418)
Com secondary school	-0.309	-0.309	-0.309	-0.309	-0.231	-0.231	-0.231	-0.231
	(0.263)	(0.263)	(0.263)	(0.263)	(0.266)	(0.266)	(0.266)	(0.266)
Com market	0.190	0.190	0.190	0.190	0.163	0.163	0.163	0.163
	(0.250)	(0.250)	(0.250)	(0.250)	(0.233)	(0.233)	(0.233)	(0.233)
Mun % land irrigated	-0.013**	-0.013**	-0.013**	-0.013**	-0.016***	-0.016***	-0.016***	-0.016***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Mun % land with maize	-0.007	-0.007	-0.007	-0.007	-0.009	-0.009	-0.009	-0.009
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Mun % land with coffee	-0.022	-0.022	-0.022	-0.022	-0.019	-0.019	-0.019	-0.019
	(0.016)	(0.016)	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)	(0.018)
Mun % land with wheat	-0.006	-0.006	-0.006	-0.006	-0.001	-0.001	-0.001	-0.001
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Mun population (10,000s of individuals)	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Mun economic diversity	-1.985***	-1.985***	-1.985***	-1.985***	-1.791***	-1.791***	-1.791***	-1.791***
	(0.562)	(0.562)	(0.562)	(0.562)	(0.581)	(0.581)	(0.581)	(0.581)
Mun marginalization index	-0.093	-0.093	-0.093	-0.093	-0.130	-0.130	-0.130	-0.130
	(0.282)	(0.282)	(0.282)	(0.282)	(0.291)	(0.291)	(0.291)	(0.291)
Mun migration intensity	-0.257	-0.257	-0.257	-0.257	-0.230	-0.230	-0.230	-0.230
	(0.160)	(0.160)	(0.160)	(0.160)	(0.174)	(0.174)	(0.174)	(0.174)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	118	118	118	118	107	107	107	107
First stage F-stat (KP)	115	115	115	115	105	105	105	105
First stage F-stat (CD)	189	189	189	189	195	195	195	195
N	1545	1545	1545	1545	1417	1417	1417	1417
Mean of outcome variable	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 [HDD] in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A6: Community Crop Loss Outcomes for *Ex Ante* 2005 Employment [IV-1st Stage]

	Ag Self	Ag Wage	Non-Ag Self	Non-Ag Wage
	(1)	(2)	(3)	(4)
Temp total spell interaction (00-02)	0.002***	0.002***	0.002***	0.002***
	[0.000]	[0.000]	[0.000]	[0.000]
HH land (ha)	0.002	0.002	0.002	0.002
	[0.002]	[0.002]	[0.002]	[0.002]
HH land ejido	-0.319***	-0.319***	-0.319***	-0.317***
	[0.118]	[0.118]	[0.118]	[0.117]
HH land other	-0.230***	-0.232***	-0.232***	-0.233***
	[0.086]	[0.086]	[0.086]	[0.086]
Age	-0.000	-0.000	-0.000	-0.000
	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.013	0.006	0.006	0.007
	[0.013]	[0.017]	[0.012]	[0.012]
Union	0.018	0.015	0.015	0.011
	[0.028]	[0.026]	[0.026]	[0.026]
Years of education	0.002	0.002	0.002	0.004
	[0.005]	[0.005]	[0.005]	[0.005]
Student	0.048	0.049	0.049	0.020
	[0.050]	[0.050]	[0.051]	[0.052]
Ag Self 02	-0.021			
	[0.023]			
Ag Wage 02		0.001		
		[0.038]		
Non-Ag Self 02			0.001	
			[0.030]	
Non-Ag Wage 02				-0.057
				[0.036]
HH size	0.001	0.001	0.001	0.000
	[0.008]	[0.008]	[0.008]	[0.008]
HH # adult females	-0.018	-0.019	-0.019	-0.017
	[0.038]	[0.038]	[0.038]	[0.038]
HH # adult males	0.015	0.015	0.015	0.015
	[0.025]	[0.025]	[0.026]	[0.025]
HH head age	0.000	0.000	0.000	0.000
	[0.001]	[0.001]	[0.001]	[0.001]
HH head education	-0.004	-0.004	-0.004	-0.004
	[0.005]	[0.005]	[0.005]	[0.005]
HH previous migrant	-0.103**	-0.103**	-0.103**	-0.101**
	[0.050]	[0.050]	[0.050]	[0.049]
HH loan	-0.096**	-0.096**	-0.096**	-0.097**
	[0.046]	[0.046]	[0.047]	[0.047]
HH piped water	0.158	0.158	0.158	0.159
	[0.120]	[0.120]	[0.120]	[0.120]
HH toilet	-0.153**	-0.153**	-0.153**	-0.156**
	[0.076]	[0.076]	[0.076]	[0.076]
Com ag employment proportion	1.798	1.798	1.797	1.796
	[2.129]	[2.129]	[2.129]	[2.129]
Com lost crop	0.150	0.149	0.149	0.151
	[0.297]	[0.297]	[0.296]	[0.296]
Com hospital	0.248	0.258	0.258	0.238
	[0.459]	[0.458]	[0.458]	[0.455]
Com secondary school	-0.386	-0.386	-0.386	-0.389
	[0.321]	[0.321]	[0.321]	[0.321]
Com market	0.075	0.076	0.076	0.077
	[0.299]	[0.300]	[0.299]	[0.299]
Mun % land irrigated	-0.018**	-0.018**	-0.018**	-0.018**
	[0.007]	[0.007]	[0.007]	[0.007]
Mun % land with maize	-0.007	-0.007	-0.007	-0.007
	[0.015]	[0.015]	[0.015]	[0.015]
Mun % land with coffee	-0.028	-0.028	-0.028	-0.028
	[0.018]	[0.018]	[0.018]	[0.018]
Mun % land with wheat	-0.019	-0.019	-0.019	-0.019
	[0.027]	[0.027]	[0.027]	[0.027]
Mun population (10,000s of individuals)	0.004	0.004	0.004	0.004
	[0.005]	[0.005]	[0.005]	[0.005]
Mun economic diversity	-1.302*	-1.289*	-1.289*	-1.281*
	[0.426]	[0.426]	[0.426]	[0.426]
Mun marginalization index	-0.053	-0.053	-0.053	-0.053
	[0.260]	[0.260]	[0.260]	[0.260]
Mun migration intensity	-0.304	-0.302	-0.303	-0.303
	[0.189]	[0.189]	[0.190]	[0.189]
State FE	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	73	73	73	74
First stage *F*-stat (KP)	71	70	70	73
First stage *F*-stat (CD)	297	296	296	297
N	2416	2416	2416	2416
R^2	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviation) and the total # of days for the max spell where the daily temp > 30 [HDD] in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A7: Community Crop Loss Outcomes for *Ex Ante* Female & Male 2005 Employment [IV-1st Stage]

	Female Employment				Male Employment			
	(1) Ag Self	(2) Ag Wage	(3) Non-Ag Self	(4) Non-Ag Wage	(5) Ag Self	(6) Ag Wage	(7) Non-Ag Self	(8) Non-Ag Wage
Temp total spell interaction (99-02)	0.053***	0.053***	0.053***	0.053***	0.050***	0.050***	0.050***	0.050***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
HH land (ha)	0.003*	0.003*	0.003	0.003*	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HH land ejido	-0.352***	-0.351***	-0.350***	-0.349***	-0.267**	-0.266**	-0.266**	-0.268**
	(0.125)	(0.124)	(0.124)	(0.123)	(0.114)	(0.113)	(0.113)	(0.113)
HH land other	-0.246**	-0.242**	-0.243**	-0.243**	-0.219**	-0.228**	-0.222**	-0.227**
	(0.098)	(0.095)	(0.096)	(0.095)	(0.088)	(0.091)	(0.089)	(0.091)
Age	-0.001	-0.001	-0.001	-0.001	0.002**	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	0.054	0.053	0.053	0.043	-0.052	-0.057	-0.056	-0.058
	(0.035)	(0.034)	(0.033)	(0.035)	(0.035)	(0.036)	(0.034)	(0.035)
Years of education	0.001	0.001	0.001	0.004	0.010	0.010	0.010	0.010
	(0.005)	(0.005)	(0.005)	(0.005)	(0.009)	(0.009)	(0.009)	(0.009)
Student	0.040	0.042	0.036	0.002	0.066	0.063	0.071	0.072
	(0.051)	(0.051)	(0.050)	(0.059)	(0.072)	(0.070)	(0.075)	(0.077)
Ag Self 02	0.081				-0.036			
	(0.145)				(0.044)			
Ag Wage 02		0.047				-0.016		
		(0.061)				(0.056)		
Non-Ag Self 02			-0.035				0.039	
			(0.044)				(0.049)	
Non-Ag Wage 02				-0.102*				0.020
				(0.056)				(0.052)
HH size	-0.002	-0.002	-0.002	-0.003	0.005	0.006	0.005	0.006
	(0.008)	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
HH # adult females	-0.009	-0.009	-0.009	-0.005	-0.033	-0.033	-0.032	-0.034
	(0.040)	(0.040)	(0.040)	(0.039)	(0.037)	(0.037)	(0.037)	(0.038)
HH # adult males	0.024	0.023	0.025	0.024	0.002	0.001	0.001	0.002
	(0.026)	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)	(0.027)	(0.026)
HH head age	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.002	-0.002	-0.002	-0.003	-0.013	-0.013	-0.013	-0.013
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
HH previous migrant	-0.117**	-0.119**	-0.116**	-0.114**	-0.086*	-0.084*	-0.086*	-0.084*
	(0.051)	(0.051)	(0.051)	(0.051)	(0.052)	(0.051)	(0.051)	(0.051)
HH loan	-0.073*	-0.072*	-0.070*	-0.074*	-0.124*	-0.125*	-0.126**	-0.124**
	(0.039)	(0.039)	(0.039)	(0.040)	(0.063)	(0.064)	(0.062)	(0.062)
HH piped water	0.162	0.163	0.163	0.164	0.152	0.150	0.152	0.150
	(0.117)	(0.118)	(0.117)	(0.118)	(0.125)	(0.125)	(0.124)	(0.126)
HH toilet	-0.162**	-0.161**	-0.161**	-0.166**	-0.139*	-0.141*	-0.142*	-0.140*
	(0.080)	(0.080)	(0.081)	(0.080)	(0.075)	(0.076)	(0.076)	(0.075)
Com bus stop	0.187	0.186	0.184	0.190	0.100	0.093	0.098	0.093
	(0.281)	(0.281)	(0.280)	(0.280)	(0.298)	(0.298)	(0.299)	(0.298)
Com hospital	0.270	0.269	0.269	0.250	0.236	0.228	0.237	0.229
	(0.455)	(0.453)	(0.453)	(0.450)	(0.477)	(0.475)	(0.475)	(0.475)
Com secondary school	-0.380	-0.384	-0.384	-0.391	-0.395	-0.397	-0.396	-0.396
	(0.318)	(0.319)	(0.318)	(0.319)	(0.327)	(0.329)	(0.329)	(0.329)
Com market	0.111	0.115	0.115	0.111	0.018	0.021	0.021	0.021
	(0.306)	(0.304)	(0.303)	(0.304)	(0.297)	(0.298)	(0.296)	(0.298)
Mun % land irrigated	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Mun % land with maize	-0.006	-0.006	-0.006	-0.006	-0.009	-0.009	-0.009	-0.009
	(0.013)	(0.013)	(0.013)	(0.013)	(0.015)	(0.015)	(0.016)	(0.016)
Mun % land with coffee	-0.025	-0.026	-0.025	-0.025	-0.027*	-0.027*	-0.027*	-0.027*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
Mun % land with wheat	-0.017	-0.018	-0.017	-0.017	-0.022	-0.022	-0.022	-0.022
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Mun population (10,000s of individuals)	0.005	0.005	0.005	0.005	0.003	0.003	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Mun economic diversity	-1.517*	-1.528*	-1.521*	-1.513*	-1.236	-1.209	-1.218	-1.213
	(0.856)	(0.848)	(0.849)	(0.852)	(0.809)	(0.817)	(0.814)	(0.817)
Mun marginalization index	-0.043	-0.043	-0.043	-0.048	-0.073	-0.073	-0.071	-0.073
	(0.284)	(0.284)	(0.285)	(0.283)	(0.302)	(0.303)	(0.303)	(0.303)
Mun migration intensity	-0.293	-0.294	-0.290	-0.297	-0.325	-0.322	-0.324	-0.323
	(0.183)	(0.182)	(0.183)	(0.183)	(0.202)	(0.202)	(0.202)	(0.202)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	73	73	75	78	64	63	64	65
First stage *F*-stat (KP)	72	74	73	76	63	61	63	65
First stage *F*-stat (CD)	157	157	156	157	133	132	133	133
N	1346	1346	1346	1346	1070	1070	1070	1070
Mean of outcome variable	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (BDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A8: Community Crop Loss Outcomes for *Ex Ante* 2002-2005 Migration [IV-1st Stage]

	Migration		
	(1) Intl	(2) Domestic Lower	(3) Domestic Upper
Temp total spell interaction [00-02]	0.052***	0.052***	0.053***
	(0.006)	(0.006)	(0.006)
HH land (ha)	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)
HH ejido	-0.339***	-0.341***	-0.336***
	(0.125)	(0.124)	(0.121)
HH land other	-0.220**	-0.213**	-0.212**
	(0.091)	(0.092)	(0.092)
Age	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Male	0.003	0.003	0.003
	(0.007)	(0.007)	(0.007)
Union	0.022	0.023	0.023
	(0.026)	(0.021)	(0.021)
Years of education	0.003	0.002	0.002
	(0.005)	(0.005)	(0.005)
Student	0.070	0.068	0.070
	(0.049)	(0.049)	(0.048)
HH size	0.002	0.001	0.000
	(0.008)	(0.008)	(0.008)
HH # adult females	-0.020	-0.019	-0.017
	(0.039)	(0.038)	(0.038)
HH # adult males	0.015	0.015	0.015
	(0.026)	(0.026)	(0.026)
HH head age	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
HH head education	-0.003	-0.003	-0.003
	(0.006)	(0.006)	(0.006)
HH previous migrant	-0.119**	-0.121**	-0.115**
	(0.049)	(0.050)	(0.049)
HH loan	-0.108**	-0.105**	-0.117**
	(0.048)	(0.046)	(0.047)
HH piped water	0.132	0.133	0.127
	(0.120)	(0.119)	(0.120)
HH toilet	-0.170**	-0.168**	-0.164**
	(0.076)	(0.077)	(0.077)
Com ag employment proportion	1.729	1.756	1.728
	(2.203)	(2.208)	(2.173)
Com bus stop	0.161	0.140	0.141
	(0.293)	(0.292)	(0.284)
Com hospital	0.186	0.191	0.189
	(0.456)	(0.457)	(0.436)
Com secondary school	-0.288	-0.289	-0.277
	(0.317)	(0.317)	(0.314)
Com market	0.071	0.064	0.057
	(0.301)	(0.302)	(0.296)
Mun % land irrigated	-0.019**	-0.018**	-0.018**
	(0.007)	(0.007)	(0.007)
Mun % land with maize	-0.008	-0.008	-0.008
	(0.015)	(0.015)	(0.015)
Mun % land with coffee	-0.025	-0.023	-0.025
	(0.016)	(0.016)	(0.016)
Mun % land with wheat	-0.015	-0.015	-0.014
	(0.027)	(0.027)	(0.027)
Mun population (10,000s of individuals)	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)
Mun economic diversity	-1.431*	-1.412*	-1.407*
	(0.828)	(0.842)	(0.836)
Mun marginalization index	-0.096	-0.096	-0.099
	(0.299)	(0.298)	(0.300)
Mun migration intensity	-0.304	-0.306	-0.303
	(0.190)	(0.190)	(0.187)
State FE	Yes	Yes	Yes
First stage F-stat (MP)	74	73	75
First stage F-stat (KP)	72	71	73
First stage F-stat (CD)	358	356	364
N	2919	2915	2952
Mean of outcome	0.06	0.08	0.06

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (KDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A9: Community Crop Loss Outcomes for *Ex Ante* Female & Male 2002-2005 Migration [IV-1st Stage]

	Proportion of neighbors with crop loss 00-02					
	Female Migration			Male Migration		
	(1) Intl	(2) Domestic Lower Bound	(3) Domestic Upper Bound	(4) Intl	(5) Domestic Lower Bound	(6) Domestic Upper Bound
Temp total spell interaction (00-02)	0.053***	0.050***	0.053***	0.052***	0.052***	0.053***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH land (ha)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	-0.030***	-0.030***	-0.032***	-0.031***	-0.032***	-0.031***
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
HH land other	-0.022**	-0.022**	-0.022**	-0.025***	-0.023**	-0.022**
	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
Age	0.000	0.000	0.000	0.000**	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Union	0.005*	0.005*	0.005*	-0.002	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Years of education	0.000	0.000	0.000	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Student	0.004	0.004	0.004	0.010	0.010	0.010*
	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.006)
HH size	-0.000	-0.000	-0.000	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH # adult females	0.000	0.000	0.000	-0.003	-0.003	-0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
HH # adult males	0.002	0.002	0.002	0.000	0.000	0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
HH head age	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH head education	-0.000	-0.000	-0.000	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH previous migrant	-0.013**	-0.013**	-0.013**	-0.011**	-0.011**	-0.011**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
HH loan	-0.007*	-0.007*	-0.008**	-0.014**	-0.014**	-0.013**
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)
HH piped water	0.016	0.016	0.016	0.010	0.010	0.010
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)
HH toilet	-0.018**	-0.017**	-0.017**	-0.014*	-0.014*	-0.014*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)
Com ag employment proportion	0.173	0.175	0.172	0.193	0.196	0.193
	(0.220)	(0.220)	(0.218)	(0.211)	(0.212)	(0.209)
Com bus stop	0.017	0.017	0.017	0.012	0.012	0.012
	(0.029)	(0.029)	(0.029)	(0.031)	(0.031)	(0.031)
Com hospital	0.020	0.021	0.021	0.013	0.013	0.013
	(0.046)	(0.046)	(0.045)	(0.047)	(0.047)	(0.047)
Com secondary school	-0.041	-0.041	-0.040	-0.037	-0.037	-0.036
	(0.032)	(0.032)	(0.031)	(0.032)	(0.032)	(0.032)
Com market	0.010	0.009	0.009	0.004	0.004	0.008
	(0.031)	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
Mun % land irrigated	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with maize	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Mun % land with coffee	-0.003	-0.003	-0.004	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mun % land with wheat	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mun population (10,000s of individuals)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun economic diversity	-0.152*	-0.151*	-0.152*	-0.129	-0.127	-0.126
	(0.086)	(0.086)	(0.084)	(0.082)	(0.083)	(0.082)
Mun marginalization index	-0.009	-0.008	-0.008	-0.012	-0.011	-0.012
	(0.030)	(0.030)	(0.030)	(0.031)	(0.031)	(0.031)
Mun migration intensity	-0.030	-0.030	-0.030	-0.030	-0.031	-0.030
	(0.018)	(0.018)	(0.018)	(0.020)	(0.020)	(0.020)
State FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	79	77	81	67	66	67
First stage F-stat (KP)	77	76	79	66	65	65
First stage F-stat (CD)	175	174	176	176	177	182
N	1,323	1,317	1,330	1,299	1,303	1,313
Mean of outcome variable	0.09	0.08	0.08	0.08	0.09	0.08

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviation) and the total # of days for the max spell where the daily temp > 30 (35?C) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A10: *Ex Ante* 2002-2003 & 2004-2005 Migration Outcomes [OLS & IV-2nd Stage]

	International				Domestic			
	2002-2003		2004-2005		2002-2003		2004-2005	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Proportion of neighbors with crop loss (00-02)	0.001	0.008***	-0.004	-0.010**	0.005	0.026***	-0.007*	-0.010
	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.007)	(0.004)	(0.012)
HH land (ha)	0.000	-0.000	-0.000	-0.000	-0.000*	-0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	0.003	0.006	-0.006	-0.008	0.008	0.017**	-0.018**	-0.019**
	(0.005)	(0.005)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
HH land other	-0.000	-0.001	-0.010*	-0.011**	-0.011	-0.008	-0.000	-0.001
	(0.002)	(0.003)	(0.006)	(0.005)	(0.008)	(0.008)	(0.009)	(0.009)
Age	-0.000	-0.000	0.000	0.000	-0.001**	-0.001**	-0.001**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.003	0.003	0.001	0.001	-0.001	-0.001	0.001	0.001
	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)
Union	0.001	0.000	0.006	0.006	-0.011	-0.012	-0.010	-0.010
	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)	(0.008)	(0.008)	(0.008)
Years of education	0.000	0.000	0.000	0.000	0.002	0.002*	0.002**	0.002**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Student	-0.003	-0.003	-0.000	0.000	-0.021	-0.020	0.005	0.005
	(0.002)	(0.002)	(0.005)	(0.005)	(0.015)	(0.011)	(0.018)	(0.018)
Intl migrant (00-03)			0.115	0.115				
			(0.113)	(0.110)				
Domestic migrant (00-03)							0.147***	0.147***
							(0.048)	(0.048)
HH size	-0.001	-0.001*	-0.002	-0.002*	-0.006***	-0.006***	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
HH # adult females	-0.001	-0.000	-0.001	-0.001	0.007	0.008	-0.005	-0.005
	(0.001)	(0.001)	(0.002)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)
HH # adult males	0.000	0.000	0.000	0.000	0.003	0.003	-0.000	-0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
HH head age	0.000	0.000	-0.000**	-0.000**	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH head education	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.002**	-0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
HH previous migrant	0.003	0.003*	0.002	0.002	0.027***	0.029***	0.006	0.006
	(0.002)	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)	(0.005)	(0.005)
HH loan	0.001	0.001	0.000	-0.001	-0.002	0.001	0.008	0.008
	(0.003)	(0.003)	(0.005)	(0.005)	(0.012)	(0.011)	(0.008)	(0.008)
HH piped water	0.002**	0.002	-0.003	-0.003	0.005	0.008	-0.018**	-0.018**
	(0.001)	(0.002)	(0.005)	(0.005)	(0.011)	(0.011)	(0.007)	(0.007)
HH toilet	0.001	0.002	-0.001	-0.001	0.008	0.010	0.002	0.002
	(0.002)	(0.002)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
Com ag employment proportion	0.031*	0.015	0.050	0.061	0.118***	0.006	0.029	0.034
	(0.016)	(0.030)	(0.048)	(0.047)	(0.080)	(0.079)	(0.035)	(0.047)
Com bus stop	0.003	0.003	0.000	0.000	-0.019	-0.020	0.023**	0.023***
	(0.002)	(0.003)	(0.005)	(0.008)	(0.014)	(0.011)	(0.010)	(0.009)
Com hospital	-0.005	0.004	0.008	0.002	-0.010	0.018	-0.017*	-0.009
	(0.006)	(0.007)	(0.013)	(0.013)	(0.021)	(0.022)	(0.031)	(0.038)
Com secondary school	0.006	0.010**	0.001	-0.003	-0.003	0.010	0.018	0.015
	(0.004)	(0.005)	(0.007)	(0.007)	(0.010)	(0.014)	(0.011)	(0.011)
Com market	0.004	0.004	-0.032***	-0.032***	-0.031**	-0.031**	0.010	0.010
	(0.002)	(0.008)	(0.009)	(0.008)	(0.013)	(0.016)	(0.014)	(0.014)
Mun % land irrigated	0.000	0.000*	-0.000*	-0.000**	-0.000**	0.000	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun % land with maize	-0.000*	-0.000	-0.000***	-0.000***	-0.000	-0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun % land with coffee	0.000	0.000*	0.000	0.000	-0.002***	-0.002**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with wheat	0.000	0.000	0.001	0.001	0.001	0.001	0.004***	0.004***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Mun population (10,000s of individuals)	0.000	0.000	0.000	0.000	0.000**	0.000**	0.000*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun economic diversity	0.020**	0.020***	0.059***	0.053***	0.004	0.033	0.027	0.024
	(0.010)	(0.010)	(0.021)	(0.020)	(0.039)	(0.047)	(0.030)	(0.034)
Mun marginalization index	0.003**	0.000*	0.006*	0.008	0.008	0.009	-0.008	-0.006
	(0.002)	(0.003)	(0.004)	(0.004)	(0.007)	(0.011)	(0.006)	(0.006)
Mun migration intensity	-0.004*	-0.003	-0.010	-0.012*	-0.015***	-0.007	-0.007	-0.008
	(0.002)	(0.003)	(0.007)	(0.007)	(0.005)	(0.008)	(0.005)	(0.007)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	73	-	73	-	73	-	73
First stage *F*-stat (KP)	-	71	-	72	-	72	-	72
First stage *F*-stat (CD)	-	338	-	339	-	359	-	339
N	2908	2908	2909	2909	2910	2910	2909	2909
R^2	0.01	0.01	0.03	0.04	0.03	0.03	0.07	0.08
Mean of outcome variable	0.003	0.003	0.01	0.01	0.03	0.03	0.02	0.02

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (2002) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A11: *Ex Ante* Female 2002-2003 & 2004-2005 Migration Outcomes [OLS & IV-2nd Stage]

	International				Domestic			
	2002-2003		2004-2005		2002-2003		2004-2005	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Proportion of neighbors with crop loss (00-02)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH land (ha)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH ejido	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH land other	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Age	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Union	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Years of education	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Student	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Intl migrant (02-03)			[illegible]	[illegible]				
			[illegible]	[illegible]				
Domestic migrant (02-03)							[illegible]	[illegible]
							[illegible]	[illegible]
HH size	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH # adult females	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH # adult males	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH head age	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH head education	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH previous migrant	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH loan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH piped water	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH toilet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Com ag employment proportion	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Com bus stop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Com hospital	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Com secondary school	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Com market	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun % land irrigated	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun % land with maize	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun % land with coffee	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun % land with wheat	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun population (10,000s of individuals)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun economic diversity	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun marginalization index	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mun migration intensity	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	78	-	78	-	79	-	79
First stage *F*-stat (KP)	-	77	-	77	-	77	-	77
First stage *F*-stat (CD)	-	176	-	173	-	176	-	175
N	1516	1516	1516	1516	1517	1517	1518	1518
R^2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean of outcome variable	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp ≥ 30 (90°F) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A12: *Ex Ante* Male 2002-2003 & 2004-2005 Migration Outcomes [OLS & IV-2nd Stage]

	International				Domestic			
	2002-2003		2004-2005		2002-2003		2004-2005	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Proportion of neighbors with crop loss (00-01)	-0.001	0.001	-0.006	-0.009	-0.008	0.013**	-0.008	-0.005
	(0.002)	(0.003)	(0.004)	(0.006)	(0.005)	(0.007)	(0.005)	(0.014)
HH land (ha)	0.000	0.000	-0.000	0.000	-0.000**	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	0.001	0.002	0.002	0.000	0.011	0.018**	0.003	0.004
	(0.007)	(0.008)	(0.004)	(0.003)	(0.009)	(0.009)	(0.013)	(0.014)
HH land other	-0.007	-0.006	-0.007	-0.009*	-0.019***	-0.014**	0.016	0.017
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.011)	(0.011)
Age	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.004*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Union	-0.005	-0.005	0.006	0.006	-0.011	-0.013	-0.006	-0.006
	(0.006)	(0.006)	(0.007)	(0.007)	(0.013)	(0.012)	(0.013)	(0.013)
Years of education	0.001	0.001	-0.001	-0.001	0.006**	0.006**	0.005**	0.005**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Student	-0.004	-0.004	-0.003	-0.003	-0.018	-0.019	-0.018	-0.019
	(0.004)	(0.005)	(0.004)	(0.004)	(0.020)	(0.020)	(0.022)	(0.021)
Intl migrant (02-03)			0.159	0.159				
			(0.146)	(0.145)				
Domestic migrant (02-03)							0.171***	0.171***
							(0.062)	(0.060)
HH size	-0.001	-0.001	-0.002	-0.002	-0.006**	-0.006***	0.002	0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HH # adult females	-0.001	-0.001	-0.002	-0.002	0.001	0.002	-0.012**	-0.011**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)
HH # adult males	0.000	0.000	0.003	0.004	0.001	0.001	0.000	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)
HH head age	-0.000	-0.000	-0.001**	-0.001**	-0.000	-0.000	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH head education	-0.000	-0.000	0.000	0.000	-0.005**	-0.005**	-0.004**	-0.004**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
HH previous migrant	0.004	0.004	0.006	0.005	0.032***	0.032***	0.003	0.003
	(0.003)	(0.003)	(0.005)	(0.004)	(0.010)	(0.010)	(0.008)	(0.008)
HH loan	-0.001	-0.001	-0.002	-0.003	0.005	0.006	0.002	0.002
	(0.004)	(0.004)	(0.003)	(0.003)	(0.011)	(0.011)	(0.007)	(0.007)
HH piped water	0.006**	0.005*	-0.002	-0.001	0.001	-0.003	-0.021*	-0.021*
	(0.003)	(0.003)	(0.006)	(0.006)	(0.011)	(0.011)	(0.012)	(0.011)
HH toilet	-0.001	-0.001	-0.002	-0.002	0.011	0.010	-0.007	-0.007
	(0.004)	(0.004)	(0.005)	(0.005)	(0.010)	(0.010)	(0.010)	(0.010)
Com ag employment proportion	0.056**	0.051*	0.039	0.050	0.199***	0.136**	-0.021	-0.025
	(0.026)	(0.030)	(0.052)	(0.051)	(0.052)	(0.066)	(0.061)	(0.067)
Com bus stop	0.009**	0.009**	-0.004	-0.004	-0.012	-0.013	0.020	0.020
	(0.004)	(0.004)	(0.005)	(0.005)	(0.017)	(0.017)	(0.013)	(0.013)
Com hospital	-0.013	-0.011	0.043**	0.038**	-0.019	0.002	-0.100**	-0.098**
	(0.010)	(0.010)	(0.020)	(0.019)	(0.022)	(0.019)	(0.040)	(0.040)
Com secondary school	0.006	0.007	-0.001	-0.003	-0.039***	-0.019	0.040***	0.041***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.010)	(0.012)	(0.013)	(0.013)
Com market	0.014*	0.014*	-0.058***	-0.058***	-0.024*	-0.023	0.024	0.024
	(0.008)	(0.008)	(0.013)	(0.014)	(0.013)	(0.015)	(0.020)	(0.020)
Mun % land irrigated	-0.000	-0.000	0.000*	-0.000*	-0.001***	-0.001**	-0.001**	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun % land with maize	-0.000**	-0.000**	-0.000**	-0.000**	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun % land with coffee	0.000	0.000	0.000	0.000	-0.003***	-0.003***	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with wheat	0.000	0.000	0.001	0.001	0.000	0.000	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Mun population (10,000s of individuals)	0.000***	0.000***	-0.000	0.000	0.001*	0.001**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun economic diversity	0.029**	0.021**	-0.086***	0.081***	-0.019	0.000	0.080	0.081
	(0.013)	(0.012)	(0.030)	(0.030)	(0.036)	(0.036)	(0.043)	(0.043)
Mun marginalization index	0.009**	0.009**	0.012**	0.011**	-0.008	-0.007	0.006	0.007
	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)	(0.007)	(0.010)	(0.010)
Mun migration intensity	-0.006**	-0.006*	-0.006	-0.008	-0.022***	-0.016**	-0.004	-0.003
	(0.003)	(0.003)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)	(0.006)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	86	-	86	-	66	-	66
First stage *F*-stat (KP)	-	81	-	84	-	64	-	63
First stage *F*-stat (CD)	-	178	-	178	-	178	-	179
N	1392	1392	1392	1392	1393	1393	1392	1392
R^2	0.03	0.03	0.04	0.06	0.04	0.04	0.09	0.11
Mean of outcome variable	0.004	0.004	0.01	0.01	0.02	0.03	0.02	0.02

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp [illegible] and the total # of days for the max spell where the daily temp > [illegible] in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A13: *Ex Ante* 2002 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Proportion of neighbors with crop loss (00-02)	0.006	0.085***	-0.000	-0.071***	0.002	-0.006	-0.032**	-0.029
	(0.008)	(0.011)	(0.016)	(0.024)	(0.009)	(0.028)	(0.015)	(0.045)
HH land (ha)	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	-0.003	0.027	-0.006	-0.033	0.019	0.016	0.016	0.019
	(0.017)	(0.021)	(0.022)	(0.026)	(0.020)	(0.020)	(0.025)	(0.029)
HH land other	0.117***	0.134***	-0.018	-0.033	-0.062*	-0.064*	-0.036	-0.034
	(0.026)	(0.024)	(0.025)	(0.026)	(0.035)	(0.034)	(0.027)	(0.029)
Age	0.004***	0.004***	-0.001**	-0.001**	-0.001	-0.001	-0.002*	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.312***	0.312***	0.168***	0.168***	0.002	0.002	0.027	0.027
	(0.031)	(0.030)	(0.026)	(0.025)	(0.015)	(0.015)	(0.024)	(0.023)
Union	0.051***	0.049***	-0.038**	-0.036**	0.007	0.007	-0.053***	-0.053***
	(0.014)	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)	(0.017)	(0.017)
Years of education	-0.002	-0.002	-0.006**	-0.006**	0.001	0.001	0.025***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Student	-0.009	-0.015	-0.105***	-0.100***	-0.110***	-0.110***	-0.341***	-0.346***
	(0.020)	(0.020)	(0.025)	(0.025)	(0.026)	(0.025)	(0.046)	(0.045)
HH size	-0.003	-0.003	0.003	0.003	-0.000	-0.000	-0.006	-0.006
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
HH # adult females	0.032***	0.030***	-0.004	-0.006	-0.023**	-0.023**	0.030**	0.030**
	(0.008)	(0.008)	(0.008)	(0.009)	(0.011)	(0.011)	(0.012)	(0.012)
HH # adult males	-0.020***	-0.022***	-0.005	-0.004	0.012	0.012	0.003	0.002
	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.008)
HH head age	-0.000	-0.000	-0.002**	-0.001**	0.001	0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.001	-0.001	-0.009***	-0.009***	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
HH previous migrant	-0.025**	-0.018	-0.009	-0.015	0.038***	0.038***	0.030	0.031
	(0.011)	(0.011)	(0.015)	(0.015)	(0.014)	(0.013)	(0.020)	(0.020)
HH loan	0.017	0.005	-0.013	-0.020	0.042*	0.042*	-0.008	-0.007
	(0.015)	(0.016)	(0.006)	(0.013)	(0.023)	(0.022)	(0.017)	(0.017)
HH piped water	0.031**	0.021	-0.034	-0.025	-0.001	-0.000	0.024	0.023
	(0.014)	(0.017)	(0.026)	(0.024)	(0.026)	(0.026)	(0.024)	(0.025)
HH toilet	0.015	0.021	-0.040***	-0.045***	0.034*	0.033*	-0.033**	-0.032*
	(0.016)	(0.018)	(0.014)	(0.017)	(0.018)	(0.017)	(0.016)	(0.017)
Com bus stop	0.049**	0.043	0.004	0.009	-0.070**	-0.070***	0.003	0.002
	(0.023)	(0.030)	(0.042)	(0.043)	(0.027)	(0.026)	(0.030)	(0.030)
Com hospital	-0.029	0.065	0.073	-0.010	0.074	0.068	-0.090	-0.092
	(0.042)	(0.046)	(0.075)	(0.076)	(0.075)	(0.076)	(0.113)	(0.131)
Com secondary school	0.009	0.039	0.036	0.029	-0.018	-0.020	-0.086*	-0.083*
	(0.018)	(0.032)	(0.039)	(0.046)	(0.023)	(0.024)	(0.050)	(0.047)
Com market	-0.029	-0.041	0.063	0.073	0.005	0.006	-0.041	-0.042
	(0.034)	(0.033)	(0.053)	(0.054)	(0.042)	(0.042)	(0.052)	(0.051)
Mun % land irrigated	-0.001	0.001	0.002***	0.001	0.001	0.001	-0.002*	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with maize	0.001	0.001	0.001	0.000	-0.000	-0.000	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	-0.002	0.000	0.007**	0.005	-0.003	-0.003*	-0.000	-0.000
	(0.001)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)
Mun % land with wheat	0.000	0.000	0.008	0.008	-0.006	-0.006	-0.000	-0.000
	(0.004)	(0.003)	(0.007)	(0.008)	(0.004)	(0.004)	(0.007)	(0.007)
Mun population (10,000s of individuals)	-0.000	-0.001	0.001	0.001	-0.002**	-0.002**	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.190***	-0.065	0.076	-0.052	0.082	0.088	0.047	0.059
	(0.054)	(0.060)	(0.098)	(0.113)	(0.080)	(0.090)	(0.066)	(0.107)
Mun marginalization index	0.011	0.026	-0.002	-0.009	-0.002	-0.003	-0.030	-0.029
	(0.016)	(0.036)	(0.029)	(0.038)	(0.015)	(0.020)	(0.029)	(0.029)
Mun migration intensity	-0.001	0.017	0.040*	0.029	0.050	0.049	-0.053**	-0.054**
	(0.008)	(0.017)	(0.024)	(0.028)	(0.033)	(0.031)	(0.023)	(0.025)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	114	-	114	-	114	-	114
First stage F-stat (KP)	-	113	-	113	-	113	-	113
First stage F-stat (CD)	-	388	-	388	-	388	-	388
N	2,962	2,962	2,962	2,962	2,962	2,962	2,962	2,962
R^2	0.28	0.29	0.12	0.14	0.03	0.04	0.18	0.21
Mean of outcome variable	0.16	0.16	0.12	0.12	0.14	0.14	0.21	0.21

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 13 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (HDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A14: *Ex Ante* Female 2002 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Proportion of neighbors with crop loss (98-02)	0.005	-0.000	0.001	-0.108***	-0.014	-0.036	-0.039**	-0.030
	(0.006)	(0.011)	(0.007)	(0.014)	(0.011)	(0.020)	(0.016)	(0.042)
HH land (ha)	-0.000*	-0.000**	-0.000	-0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	0.028*	0.029**	0.001	-0.015	0.028	0.019	0.005	0.012
	(0.014)	(0.014)	(0.020)	(0.021)	(0.026)	(0.025)	(0.051)	(0.055)
HH land other	0.043*	0.046*	-0.017	-0.026	-0.012	-0.016	-0.021	-0.017
	(0.025)	(0.024)	(0.016)	(0.016)	(0.042)	(0.041)	(0.029)	(0.029)
Age	0.001	0.001	-0.000	-0.000	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Union	-0.028*	-0.028**	-0.028**	-0.026**	0.035	0.036*	-0.071***	-0.074***
	(0.014)	(0.014)	(0.013)	(0.013)	(0.022)	(0.022)	(0.026)	(0.026)
Years of education	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	0.030***	0.030***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)
Student	-0.009	-0.009	-0.046**	-0.045**	-0.089***	-0.089***	-0.352***	-0.352***
	(0.008)	(0.008)	(0.020)	(0.020)	(0.030)	(0.030)	(0.053)	(0.052)
HH size	0.000	0.001	0.001	0.001	-0.004	-0.004	-0.007	-0.007
	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
HH # adult females	-0.005	-0.005	0.002	0.002	-0.006	-0.006	0.029*	0.029**
	(0.005)	(0.005)	(0.008)	(0.008)	(0.016)	(0.016)	(0.015)	(0.014)
HH # adult males	-0.009**	-0.009***	-0.005	-0.004	0.003	0.002	0.015	0.015
	(0.004)	(0.004)	(0.008)	(0.008)	(0.014)	(0.013)	(0.009)	(0.009)
HH head age	0.000	0.000	-0.001**	-0.001**	0.000	0.001	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	0.000	0.000	-0.006***	-0.006***	-0.005*	-0.005*	-0.004	-0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
HH previous migrant	-0.005	-0.019	0.004	0.009	0.044**	0.042**	0.028	0.030
	(0.007)	(0.007)	(0.012)	(0.012)	(0.021)	(0.020)	(0.030)	(0.029)
HH loan	0.017*	0.017*	-0.005	-0.006	0.046	0.045	-0.001	0.001
	(0.010)	(0.009)	(0.014)	(0.013)	(0.028)	(0.027)	(0.025)	(0.026)
HH piped water	-0.020	-0.018	-0.032**	-0.027*	0.054	0.057*	0.029	0.027
	(0.010)	(0.010)	(0.016)	(0.015)	(0.033)	(0.033)	(0.024)	(0.025)
HH toilet	0.002	0.003	-0.031***	-0.032***	0.013	0.010	-0.037	-0.036
	(0.008)	(0.008)	(0.011)	(0.011)	(0.027)	(0.026)	(0.024)	(0.025)
Com bus stop	-0.012	-0.013	0.010	0.014	-0.050	-0.048	0.030	0.038
	(0.015)	(0.018)	(0.011)	(0.013)	(0.096)	(0.095)	(0.044)	(0.044)
Com hospital	-0.071*	-0.067*	0.023	-0.024	0.163	0.137	-0.139	-0.117
	(0.036)	(0.040)	(0.029)	(0.048)	(0.096)	(0.096)	(0.106)	(0.135)
Com secondary school	-0.027*	-0.026*	0.056***	0.040*	-0.062	-0.051*	-0.073*	-0.065*
	(0.015)	(0.014)	(0.018)	(0.020)	(0.029)	(0.030)	(0.038)	(0.035)
Com market	0.047	0.047	-0.012	-0.005	0.026	0.030	-0.041	-0.044
	(0.029)	(0.029)	(0.018)	(0.023)	(0.062)	(0.059)	(0.051)	(0.048)
Mun % land irrigated	-0.000*	-0.000	0.000	-0.000	0.003*	0.002*	-0.002*	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with maize	0.000	0.000	-0.000	-0.000	0.001	0.000	-0.004***	-0.004***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	-0.003***	-0.003***	0.004***	0.003**	-0.003	-0.004	0.002	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)
Mun % land with wheat	-0.002**	-0.002**	0.013***	0.012***	-0.004	-0.004	0.003	0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)
Mun population (10,000s of individuals)	0.001**	0.001**	0.001*	0.001	-0.003***	-0.003***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.127***	-0.121***	0.028	-0.048	0.002	0.050	0.030	0.067
	(0.042)	(0.042)	(0.033)	(0.049)	(0.108)	(0.118)	(0.098)	(0.114)
Mun marginalization index	-0.004	-0.004	-0.021*	-0.025	0.030	0.029	-0.040	-0.038
	(0.011)	(0.011)	(0.012)	(0.018)	(0.024)	(0.023)	(0.026)	(0.029)
Mun migration intensity	-0.001	0.000	0.015**	0.003	0.086**	0.081**	-0.033	-0.029
	(0.006)	(0.007)	(0.006)	(0.008)	(0.038)	(0.036)	(0.036)	(0.036)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	118	-	118	-	118	-	118
First stage *F*-stat (KP)	-	115	-	115	-	115	-	115
First stage *F*-stat (CD)	-	189	-	189	-	189	-	189
N	1,545	1,545	1,545	1,545	1,545	1,545	1,545	1,545
R^2	0.06	0.10	0.35	0.38	0.05	0.07	0.18	0.24
Mean of outcome variable	0.02	0.02	0.04	0.04	0.14	0.14	0.20	0.20

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviation) and the total # of days for the max spell where the daily temp > 30 (DD30) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A15: *Ex Ante* Male 2002 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Proportion of neighbors with crop loss (00-02)	0.006	0.156***	0.001	-0.097**	0.0190	0.036*	-0.030	-0.028
	(0.019)	(0.023)	(0.029)	(0.045)	(0.013)	(0.021)	(0.021)	(0.065)
HH land (ha)	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	-0.021	0.020	-0.013	-0.047	0.010	0.016	0.029	0.026
	(0.036)	(0.042)	(0.050)	(0.041)	(0.025)	(0.025)	(0.033)	(0.040)
HH land other	0.189***	0.220***	-0.022	-0.042	-0.106***	-0.103***	-0.047	-0.049
	(0.046)	(0.046)	(0.045)	(0.045)	(0.037)	(0.036)	(0.041)	(0.041)
Age	0.007***	0.008***	-0.003**	-0.003**	-0.001	-0.001	-0.002**	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	0.107***	0.105***	-0.021	-0.020	-0.010	-0.011	-0.019	-0.019
	(0.028)	(0.028)	(0.029)	(0.028)	(0.025)	(0.024)	(0.023)	(0.022)
Years of education	-0.008**	-0.009**	-0.009*	-0.009*	0.001	0.001	0.015***	0.015***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Student	-0.012	-0.028	-0.169***	-0.159***	-0.134***	-0.136***	-0.320***	-0.319***
	(0.033)	(0.035)	(0.042)	(0.043)	(0.040)	(0.039)	(0.057)	(0.057)
HH size	-0.010*	-0.009*	0.006	0.006	0.004	0.004	-0.004	-0.004
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
HH # adult females	0.015	0.022	-0.007	-0.011	-0.027*	-0.028*	0.016	0.016
	(0.016)	(0.017)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.014)
HH # adult males	0.009	0.010	-0.007	-0.007	0.010	0.009	-0.005	-0.005
	(0.012)	(0.016)	(0.012)	(0.013)	(0.011)	(0.010)	(0.013)	(0.013)
HH head age	0.000	0.000	-0.001	-0.001	0.001	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.000	0.001	-0.011*	-0.012**	0.005	0.005	0.007	0.007
	(0.003)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
HH previous migrant	-0.029	-0.018	-0.020	-0.029	0.032*	0.035*	0.024	0.023
	(0.023)	(0.023)	(0.028)	(0.027)	(0.019)	(0.018)	(0.028)	(0.028)
HH loan	0.021	0.040	-0.023	-0.035	0.039	0.041*	-0.008	-0.009
	(0.027)	(0.028)	(0.030)	(0.030)	(0.031)	(0.024)	(0.022)	(0.023)
HH piped water	0.076**	0.060*	-0.038	-0.028	-0.054	-0.056*	0.017	0.017
	(0.028)	(0.034)	(0.048)	(0.044)	(0.033)	(0.032)	(0.039)	(0.038)
HH toilet	0.036	0.035	-0.052*	-0.058*	0.059***	0.060***	-0.031	-0.032
	(0.021)	(0.035)	(0.029)	(0.030)	(0.021)	(0.021)	(0.021)	(0.020)
Com bus stop	0.102**	0.089	0.002	0.006	-0.080***	-0.081***	0.028	0.029
	(0.050)	(0.067)	(0.080)	(0.079)	(0.027)	(0.027)	(0.044)	(0.044)
Com hospital	0.079	0.243**	0.116	0.000	-0.046	-0.027	-0.053	-0.062
	(0.113)	(0.108)	(0.145)	(0.141)	(0.061)	(0.056)	(0.133)	(0.163)
Com secondary school	0.042	0.095	0.002	0.027	0.005	0.009	-0.101	-0.104
	(0.041)	(0.063)	(0.076)	(0.084)	(0.031)	(0.024)	(0.079)	(0.076)
Com market	-0.143**	-0.160**	0.102	0.173*	0.008	0.001	-0.045	-0.044
	(0.053)	(0.065)	(0.107)	(0.104)	(0.036)	(0.034)	(0.081)	(0.078)
Mun % land irrigated	-0.001	0.001	0.004***	0.002	0.000	0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Mun % land with maize	0.001	0.002	0.002	0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Mun % land with coffee	-0.001	0.002	0.010*	0.008	-0.003*	-0.003	-0.003	-0.003
	(0.003)	(0.005)	(0.005)	(0.006)	(0.002)	(0.002)	(0.003)	(0.003)
Mun % land with wheat	0.004	0.003	0.002	0.002	-0.007*	-0.008*	-0.004	-0.004
	(0.008)	(0.008)	(0.012)	(0.011)	(0.004)	(0.004)	(0.013)	(0.013)
Mun population (10,000s of individuals)	-0.002	-0.002*	0.000	0.001	-0.000	-0.000	0.003**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.242**	0.005	0.111	-0.011	0.079	0.047	0.006	0.052
	(0.113)	(0.156)	(0.166)	(0.206)	(0.073)	(0.070)	(0.153)	(0.170)
Mun marginalization index	0.034	0.011	0.034	0.023	-0.046*	-0.042*	-0.020	-0.020
	(0.039)	(0.075)	(0.052)	(0.062)	(0.027)	(0.024)	(0.041)	(0.043)
Mun migration intensity	0.002	0.024	0.082*	0.062	0.006	0.009	-0.076***	-0.077***
	(0.030)	(0.033)	(0.046)	(0.052)	(0.024)	(0.023)	(0.027)	(0.032)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	207	-	207	-	207	-	207
First stage F-stat (KP)	-	205	-	205	-	205	-	205
First stage F-stat (CD)	-	195	-	195	-	195	-	195
N	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417
R^2	0.24	0.28	0.09	0.13	0.05	0.06	0.13	0.22
Mean of outcome variable	0.32	0.32	0.21	0.21	0.15	0.15	0.22	0.22

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviation) and the total # of days for the max spell where the daily temp > 30 (DEG) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A16: *Ex Ante* 2005 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Proportion of neighbors with crop loss (00-02)	0.004	0.050***	0.024**	-0.008	-0.009	-0.012	-0.006	-0.015
	(0.008)	(0.012)	(0.011)	(0.016)	(0.011)	(0.025)	(0.009)	(0.025)
HH land (ha)	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	-0.002	0.015	-0.021	-0.031*	0.041**	0.040**	0.025	0.022
	(0.020)	(0.022)	(0.016)	(0.019)	(0.019)	(0.019)	(0.022)	(0.023)
HH land other	-0.042	-0.029	-0.003	-0.011	0.043	0.042	0.008	0.006
	(0.025)	(0.025)	(0.023)	(0.023)	(0.028)	(0.027)	(0.030)	(0.029)
Age	0.002***	0.002***	-0.001	-0.001	0.000	0.000	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.197***	0.197***	0.152***	0.153***	0.029*	0.029*	0.084***	0.084***
	(0.027)	(0.026)	(0.022)	(0.022)	(0.016)	(0.016)	(0.020)	(0.020)
Union	0.029*	0.027**	-0.020	-0.019	0.001	0.001	-0.074***	-0.074***
	(0.016)	(0.016)	(0.016)	(0.015)	(0.012)	(0.013)	(0.020)	(0.020)
Years of education	0.001	0.001	-0.004*	-0.005*	-0.003	-0.003	0.018***	0.019***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Student	-0.002	-0.004	-0.071***	-0.070***	-0.032	-0.032	-0.050	-0.050
	(0.016)	(0.016)	(0.020)	(0.019)	(0.025)	(0.024)	(0.031)	(0.031)
Ag Self 02	0.288***	0.287***						
	(0.027)	(0.027)						
Ag Wage 02			0.223***	0.222***				
			(0.033)	(0.032)				
Non-Ag Self 02					0.189***	0.188***		
					(0.028)	(0.027)		
Non-Ag Wage 02							0.274***	0.273***
							(0.025)	(0.025)
HH size	0.003	0.003	0.003	0.003	-0.001	-0.001	-0.003	-0.003
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
HH # adult females	0.010	0.011	0.002	0.001	0.008	0.009	-0.005	-0.005
	(0.009)	(0.009)	(0.007)	(0.007)	(0.010)	(0.010)	(0.011)	(0.011)
HH # adult males	-0.002	-0.003	-0.001	-0.000	-0.011	-0.011	0.003	0.003
	(0.009)	(0.009)	(0.010)	(0.009)	(0.008)	(0.008)	(0.011)	(0.011)
HH head age	0.000	-0.000	-0.000	-0.000	-0.001	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.001	-0.001	-0.002	-0.002	0.006*	0.006*	-0.008**	-0.008**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
HH previous migrant	0.004	0.007	-0.012	-0.014	-0.008	-0.008	0.015	0.014
	(0.014)	(0.015)	(0.011)	(0.011)	(0.017)	(0.017)	(0.016)	(0.015)
HH loan	0.009	0.013	-0.005	-0.008	-0.031*	-0.031*	0.009	0.008
	(0.014)	(0.015)	(0.013)	(0.013)	(0.017)	(0.017)	(0.016)	(0.016)
HH piped water	-0.023	-0.009	-0.007	-0.001	0.059**	0.059**	0.013	0.015
	(0.020)	(0.022)	(0.027)	(0.027)	(0.023)	(0.026)	(0.023)	(0.023)
HH toilet	0.017	0.021	0.012	0.010	-0.007	-0.007	-0.027	-0.029*
	(0.014)	(0.013)	(0.014)	(0.014)	(0.017)	(0.017)	(0.017)	(0.016)
Com ag employment proportion	0.022	-0.069	0.489***	0.541***	0.085	-0.078	-0.544***	-0.513***
	(0.070)	(0.149)	(0.091)	(0.155)	(0.167)	(0.179)	(0.116)	(0.145)
Com bus stop	-0.011	-0.013	-0.022	-0.021	0.031	0.032	0.014	0.019
	(0.015)	(0.022)	(0.021)	(0.026)	(0.032)	(0.033)	(0.032)	(0.021)
Com hospital	-0.002	0.011	0.066	0.032	0.061	0.060	-0.087	-0.100*
	(0.030)	(0.030)	(0.052)	(0.057)	(0.117)	(0.107)	(0.062)	(0.064)
Com secondary school	-0.037	-0.011	0.040	0.023	-0.012	-0.014	0.008	0.003
	(0.024)	(0.030)	(0.028)	(0.035)	(0.035)	(0.037)	(0.019)	(0.020)
Com market	0.020	0.018	-0.049	-0.049	-0.059	-0.039	0.047	0.047
	(0.022)	(0.029)	(0.034)	(0.031)	(0.062)	(0.063)	(0.033)	(0.033)
Mun % land irrigated	-0.001***	-0.000	0.001*	0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Mun % land with maize	0.001*	0.001**	0.001	0.000	-0.001	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	-0.001	0.001	0.002	0.001	0.002	0.002	0.000	-0.000
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Mun % land with wheat	0.000	0.001	-0.007***	-0.007***	0.006**	0.006**	0.009**	0.009**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Mun population (10,000s of individuals)	-0.000	-0.000	0.000	0.001	-0.000	-0.000	0.003***	0.003***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.136**	-0.077	0.229***	0.192***	0.132	0.160	-0.027	-0.038
	(0.060)	(0.071)	(0.061)	(0.074)	(0.131)	(0.124)	(0.080)	(0.073)
Mun marginalization index	-0.029	-0.028	0.011	0.010	0.048*	0.048*	-0.009	-0.010
	(0.015)	(0.024)	(0.021)	(0.024)	(0.027)	(0.026)	(0.014)	(0.013)
Mun migration intensity	-0.035***	-0.019	0.012	0.002	0.037	0.036	-0.007	-0.010
	(0.009)	(0.014)	(0.012)	(0.016)	(0.025)	(0.022)	(0.014)	(0.016)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	72	-	72	-	73	-	74
First stage F-stat (KP)	-	71	-	70	-	70	-	73
First stage F-stat (CD)	-	297	-	296	-	296	-	297
N	2,418	2,418	2416	2,416	2,436	2,416	2,418	2,416
R^2	0.36	0.34	0.19	0.21	0.08	0.11	0.22	0.27
Mean of outcome variable	0.15	0.15	0.11	0.11	0.11	0.11	0.19	0.19

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 32 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviation) and the total # of days for the max spell where the daily temp > 30 (DDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A17: *Ex Ante* Female 2005 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Proportion of neighbors with crop loss (00-02)	0.006	0.010*	0.026	-0.023**	-0.017*	-0.056**	-0.006	-0.006
	(0.007)	(0.005)	(0.014)	(0.015)	(0.010)	(0.027)	(0.010)	(0.025)
HH land (ha)	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	0.007	0.008	0.014*	-0.006	0.013	-0.002	-0.021	-0.021
	(0.011)	(0.010)	(0.007)	(0.014)	(0.020)	(0.028)	(0.026)	(0.027)
HH land other	0.005	0.007	-0.002	-0.017*	0.006	0.025	-0.013	-0.013
	(0.015)	(0.014)	(0.006)	(0.009)	(0.034)	(0.032)	(0.031)	(0.032)
Age	0.001**	0.001**	-0.000	-0.001*	0.001	0.001	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	-0.009	-0.010	-0.015	-0.011	-0.015	-0.012	-0.113***	-0.113***
	(0.011)	(0.011)	(0.011)	(0.010)	(0.016)	(0.016)	(0.025)	(0.026)
Years of education	0.002***	0.002***	-0.002	-0.002*	-0.004	-0.006	0.020***	0.020***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)
Student	-0.012	-0.012	-0.027***	-0.026***	-0.015	-0.015	-0.023	-0.023
	(0.007)	(0.007)	(0.011)	(0.010)	(0.025)	(0.024)	(0.042)	(0.041)
Ag Self 02	0.045	0.044						
	(0.044)	(0.045)						
Ag Wage 02			0.178***	0.176***				
			(0.043)	(0.045)				
Non-Ag Self 02					0.206***	0.204***		
					(0.030)	(0.029)		
Non-Ag Wage 02							0.229***	0.229***
							(0.034)	(0.036)
HH size	-0.000	-0.000	0.003**	0.003**	-0.003	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.006)	(0.005)
HH # adult females	-0.007	-0.007	-0.007	-0.007	0.018*	0.019*	0.005	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.011)	(0.010)	(0.012)	(0.012)
HH # adult males	0.005	0.005	-0.010	-0.009	-0.013	-0.018	0.007	0.007
	(0.007)	(0.007)	(0.006)	(0.006)	(0.012)	(0.011)	(0.010)	(0.010)
HH head age	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.001	-0.001	-0.002	-0.002	0.007**	0.007**	-0.005**	-0.005**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
HH previous migrant	0.000	0.001	-0.002	-0.006	-0.014	-0.017	0.016	0.016
	(0.009)	(0.009)	(0.008)	(0.008)	(0.018)	(0.018)	(0.022)	(0.021)
HH loan	-0.000	-0.000	-0.010	-0.014	-0.025	-0.028	0.013	0.013
	(0.013)	(0.013)	(0.011)	(0.011)	(0.024)	(0.023)	(0.034)	(0.035)
HH piped water	0.008	0.008	-0.023*	-0.015	0.031	0.028	0.001	0.001
	(0.007)	(0.007)	(0.012)	(0.013)	(0.024)	(0.025)	(0.022)	(0.023)
HH toilet	-0.005	-0.004	-0.006	-0.010	0.001	-0.004	-0.007	-0.007
	(0.006)	(0.006)	(0.008)	(0.009)	(0.023)	(0.023)	(0.019)	(0.018)
Com ag employment proportion	0.002	-0.005	0.267***	0.366*	-0.176	-0.095	-0.336***	-0.339**
	(0.061)	(0.065)	(0.091)	(0.210)	(0.172)	(0.195)	(0.115)	(0.127)
Com bus stop	-0.002	-0.002	0.011	0.020	-0.005	-0.002	-0.022	-0.022
	(0.012)	(0.012)	(0.017)	(0.045)	(0.037)	(0.041)	(0.027)	(0.026)
Com hospital	0.030	0.050*	-0.005	-0.068	0.029	-0.015	0.002	0.003
	(0.021)	(0.019)	(0.046)	(0.041)	(0.112)	(0.098)	(0.055)	(0.055)
Com secondary school	-0.012	-0.016	-0.026*	0.033*	0.041	0.028	-0.039**	-0.038*
	(0.014)	(0.013)	(0.015)	(0.029)	(0.033)	(0.032)	(0.019)	(0.022)
Com market	-0.023	-0.024	0.026*	0.030*	-0.017	-0.016	0.007	0.007
	(0.016)	(0.015)	(0.016)	(0.017)	(0.079)	(0.073)	(0.038)	(0.037)
Mun % land irrigated	-0.000	-0.000	-0.000	-0.001	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Mun % land with maize	0.001***	0.001***	0.000	0.000	-0.001	-0.001	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	-0.003***	-0.003***	0.000	-0.001	0.004	0.003	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Mun % land with wheat	-0.001	-0.001	-0.002	-0.002	0.007**	0.006**	0.004	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Mun population (10,000s of individuals)	0.001**	0.000**	-0.000	0.000	0.000	0.000	0.002***	0.002***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.161***	-0.156***	0.171***	0.102	0.225*	0.173	-0.015	-0.014
	(0.034)	(0.027)	(0.053)	(0.066)	(0.124)	(0.113)	(0.084)	(0.077)
Mun marginalization index	-0.026*	-0.026*	0.016	0.014	0.061**	0.050**	-0.016	-0.016
	(0.008)	(0.008)	(0.016)	(0.018)	(0.024)	(0.026)	(0.019)	(0.018)
Mun migration intensity	-0.009	-0.006	-0.007	-0.022	0.049	0.037	-0.008	-0.008
	(0.005)	(0.006)	(0.008)	(0.014)	(0.035)	(0.034)	(0.012)	(0.016)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	73	-	75	-	75	-	79
First stage *F*-stat (KP)	-	72	-	74	-	73	-	76
First stage *F*-stat (CD)	-	157	-	157	-	156	-	157
N	1,346	1,346	1,346	1,346	1,346	1,345	1,346	1,346
R^2	0.05	0.07	0.12	0.09	0.21	0.17	0.24	0.26
Mean of outcome variable	0.02	0.02	0.02	0.02	0.10	0.10	0.11	0.15

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (32F?) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A18: *Ex Ante* Male 2005 Employment Outcomes [OLS & IV-2nd Stage]

	Ag Self		Ag Wage		Non-Ag Self		Non-Ag Wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Proportion of neighbors with crop loss [00-02]	-0.006	0.110***	0.033**	0.025	0.005	0.040	-0.004	-0.026
	(0.021)	(0.028)	(0.016)	(0.028)	(0.016)	(0.028)	(0.012)	(0.030)
HH land (ha)	0.000	0.000	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH land ejido	-0.013	0.017	-0.029	-0.061*	0.074***	0.086***	0.084**	0.078**
	(0.043)	(0.047)	(0.030)	(0.037)	(0.027)	(0.027)	(0.034)	(0.034)
HH land other	-0.081	-0.054	0.002	-0.000	0.051	0.058	0.090**	0.094**
	(0.053)	(0.053)	(0.052)	(0.051)	(0.039)	(0.039)	(0.046)	(0.045)
Age	0.003*	0.003*	-0.002*	-0.002*	-0.001	-0.001	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	0.059*	0.062**	-0.005	-0.005	0.032	0.033	-0.008	-0.007
	(0.032)	(0.032)	(0.038)	(0.037)	(0.026)	(0.026)	(0.028)	(0.027)
Years of education	-0.008**	-0.009**	-0.012**	-0.012**	-0.002	-0.003	0.019**	0.019***
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)
Student	-0.013	-0.029	-0.142***	-0.143***	-0.054	-0.057	-0.090*	-0.098*
	(0.040)	(0.043)	(0.042)	(0.041)	(0.043)	(0.041)	(0.056)	(0.050)
Ag Self 02	0.239***	0.232***						
	(0.036)	(0.035)						
Ag Wage 02			0.192***	0.192***				
			(0.036)	(0.035)				
Non-Ag Self 02					0.159***	0.158***		
					(0.038)	(0.037)		
Non-Ag Wage 02							0.263***	0.263***
							(0.037)	(0.036)
HH size	0.007	0.007	0.001	0.001	0.004	0.004	-0.003	-0.003
	(0.006)	(0.006)	(0.007)	(0.007)	(0.005)	(0.005)	(0.006)	(0.005)
HH # adult females	0.004	0.008	0.010	0.009	-0.012	-0.011	-0.019	-0.020
	(0.018)	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)	(0.019)	(0.019)
HH # adult males	0.005	0.003	0.014	0.014	-0.013	-0.013	0.003	0.005
	(0.016)	(0.016)	(0.016)	(0.017)	(0.012)	(0.011)	(0.017)	(0.017)
HH head age	0.001	0.001	0.001	0.001	-0.000	-0.000	-0.002	-0.002
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
HH head education	0.005	0.005	0.003	0.003	0.006	0.007	-0.013	-0.013
	(0.005)	(0.005)	(0.008)	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)
HH previous migrant	0.006	0.013	-0.019	-0.019	-0.001	0.000	0.007	0.006
	(0.026)	(0.027)	(0.024)	(0.023)	(0.021)	(0.024)	(0.018)	(0.018)
HH loan	0.030	0.042	-0.003	-0.003	-0.039	-0.038	0.002	-0.006
	(0.027)	(0.029)	(0.030)	(0.029)	(0.026)	(0.025)	(0.027)	(0.027)
HH piped water	-0.054	-0.077	-0.061	-0.059	0.090**	0.084**	0.027	0.031
	(0.043)	(0.047)	(0.052)	(0.052)	(0.041)	(0.042)	(0.045)	(0.045)
HH toilet	0.057*	0.066**	0.027	0.027	-0.016	-0.013	-0.057*	-0.059**
	(0.030)	(0.030)	(0.030)	(0.030)	(0.026)	(0.025)	(0.030)	(0.029)
Com ag employment proportion	0.087	-0.209	0.702***	0.727***	0.001	-0.092	-0.763***	-0.720***
	(0.176)	(0.272)	(0.181)	(0.197)	(0.181)	(0.197)	(0.171)	(0.206)
Com bus stop	-0.019	-0.015	-0.069*	-0.068*	0.076**	0.077**	0.056**	0.055**
	(0.034)	(0.048)	(0.040)	(0.039)	(0.031)	(0.035)	(0.025)	(0.025)
Com hospital	-0.094	0.023	0.161	0.154	0.079	0.113	-0.224**	-0.247***
	(0.085)	(0.076)	(0.108)	(0.108)	(0.128)	(0.125)	(0.088)	(0.092)
Com secondary school	-0.090*	-0.036	0.132**	0.131**	-0.073	-0.054	0.063**	0.053*
	(0.052)	(0.074)	(0.060)	(0.059)	(0.043)	(0.049)	(0.032)	(0.032)
Com market	0.050	0.075	-0.131*	-0.131*	-0.092	-0.094	0.197**	0.195**
	(0.068)	(0.083)	(0.073)	(0.072)	(0.080)	(0.080)	(0.044)	(0.044)
Mun % land irrigated	-0.003***	-0.001	0.002**	0.002**	0.000	0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with maize	0.001	0.002	0.001	0.001	-0.002	-0.001	0.003***	0.003***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Mun % land with coffee	0.001	0.004	0.004	0.004	-0.000	0.001	0.002	0.002
	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.002)	(0.002)
Mun % land with wheat	0.000	0.002	-0.011**	-0.011**	0.005	0.006	0.015***	0.014***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Mun population (10,000s of individuals)	-0.000	-0.000	0.001	0.001	-0.000	-0.000	0.003***	0.003***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Mun economic diversity	-0.182	-0.077	0.307**	0.300**	0.146	0.179	-0.054	-0.075
	(0.144)	(0.164)	(0.134)	(0.132)	(0.151)	(0.148)	(0.095)	(0.090)
Mun marginalization index	-0.034	-0.029	0.005	0.005	0.031	0.032	-0.006	-0.007
	(0.032)	(0.046)	(0.042)	(0.042)	(0.034)	(0.040)	(0.016)	(0.017)
Mun migration intensity	-0.079***	-0.043	0.040	0.037	0.022	0.034	0.008	0.000
	(0.021)	(0.035)	(0.030)	(0.030)	(0.036)	(0.036)	(0.019)	(0.022)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	64	-	63	-	64	-	65
First stage F-stat (KP)	-	43	-	41	-	42	-	40
First stage F-stat (CD)	-	133	-	133	-	133	-	153
N	1,070	1,070	1,070	1,070	1,070	1,070	1,070	1,070
R^2	0.18	0.20	0.14	0.19	0.08	0.10	0.24	0.22
Mean of outcome variable	0.31	0.31	0.21	0.21	0.12	0.12	0.23	0.23

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (DDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A19: *Ex Ante* 2002-2005 Migration Outcomes [OLS & IV-2nd Stage]

	Migration					
	Intl		Domestic Lower Bound		Domestic Upper Bound	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Proportion of neighbors with crop loss (00-02)	0.006	0.010	-0.002	0.030**	-0.005	0.040**
	(0.007)	(0.011)	(0.004)	(0.012)	(0.007)	(0.017)
HH land (ha)	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	-0.012	-0.011	-0.009	0.003	-0.021	-0.005
	(0.010)	(0.010)	(0.012)	(0.012)	(0.015)	(0.016)
HH land other	-0.014	-0.013	-0.011	-0.003	-0.001	0.010
	(0.011)	(0.012)	(0.012)	(0.012)	(0.016)	(0.016)
Age	-0.002***	-0.002***	-0.001***	-0.001***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.022***	0.022***	0.003	0.002	0.000	-0.000
	(0.010)	(0.010)	(0.006)	(0.006)	(0.007)	(0.007)
Union	-0.013	-0.013	-0.027***	-0.028***	-0.021**	-0.023**
	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Years of education	0.000	0.000	0.003***	0.003***	0.004*	0.004**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Student	-0.029	-0.029	-0.027	-0.029	-0.023	-0.026
	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)
HH size	-0.003	-0.003	-0.005**	-0.005***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HH # adult females	-0.003	-0.003	0.002	0.002	-0.005	-0.005
	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)	(0.006)
HH # adult males	-0.001	-0.001	0.008	0.008	0.011	0.010
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
HH head age	-0.001	-0.001	0.001	0.001	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HH previous migrant	-0.000	-0.000	0.040***	0.042***	0.049***	0.051***
	(0.007)	(0.007)	(0.010)	(0.010)	(0.013)	(0.013)
HH loan	-0.004	-0.004	0.006	0.009	0.010	0.014
	(0.012)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)
HH piped water	0.011	0.011	-0.003	-0.009	-0.021	-0.029
	(0.012)	(0.013)	(0.008)	(0.010)	(0.016)	(0.016)
HH toilet	0.011	0.011	0.002	0.005	0.000	0.004
	(0.009)	(0.009)	(0.011)	(0.011)	(0.016)	(0.016)
Com ag employment proportion	-0.100	-0.106	0.164***	0.003	-0.023	-0.119
	(0.128)	(0.136)	(0.047)	(0.095)	(0.104)	(0.149)
Com bus stop	0.004	0.004	-0.010	-0.011	0.002	0.000
	(0.018)	(0.018)	(0.011)	(0.018)	(0.017)	(0.022)
Com hospital	0.040	0.043	-0.053	-0.015	-0.057	-0.065
	(0.054)	(0.052)	(0.032)	(0.037)	(0.046)	(0.059)
Com secondary school	0.035**	0.036***	0.015*	0.032**	-0.012	0.011
	(0.014)	(0.014)	(0.009)	(0.015)	(0.016)	(0.024)
Com market	-0.032	-0.032	-0.012	-0.012	0.030	0.030
	(0.039)	(0.039)	(0.018)	(0.020)	(0.033)	(0.040)
Mun % land irrigated	-0.000	-0.000	-0.001***	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Mun % land with maize	-0.001	-0.001	-0.001***	-0.001	-0.001	-0.001
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	0.002	0.002	-0.003***	-0.002**	-0.004***	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mun % land with wheat	0.005***	0.005***	0.004**	0.004**	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
Mun population (10,000s of individuals)	0.000	0.000	0.001**	0.001***	0.001***	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Mun economic diversity	0.097	0.101	0.040	0.079*	-0.096	-0.042
	(0.081)	(0.073)	(0.034)	(0.042)	(0.060)	(0.075)
Mun marginalization index	0.019	0.018	0.004	0.007	-0.009	-0.003
	(0.012)	(0.012)	(0.008)	(0.014)	(0.018)	(0.022)
Mun migration intensity	0.032	0.033	-0.019***	-0.009	-0.008	0.006
	(0.024)	(0.023)	(0.006)	(0.011)	(0.011)	(0.016)
State FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	74	-	73	-	75
First stage F-stat (KP)	-	72	-	71	-	73
First stage F-stat (CD)	-	358	-	356	-	364
N	2,919	2,919	2,910	2,910	2,952	2,952
R^2	0.05	0.09	0.06	0.06	0.04	0.04
Mean of *outcome* variable	0.04	0.04	0.05	0.05	0.06	0.06

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (DDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A20: *Ex Ante* Female 2002-2005 Migration Outcomes [OLS & IV-2nd Stage]

	Migration					
	Intl		Domestic Lower Bound		Domestic Upper Bound	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Proportion of neighbors with crop loss (00-02)	-0.008	-0.004	-0.005	0.029***	-0.004	0.031**
	(0.008)	(0.011)	(0.008)	(0.010)	(0.008)	(0.015)
HH land (ha)	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	-0.001	0.001	-0.035**	-0.024	-0.046**	-0.032*
	(0.013)	(0.013)	(0.017)	(0.017)	(0.018)	(0.019)
HH land other	-0.002	-0.001	-0.015	-0.008	-0.015	-0.007
	(0.015)	(0.015)	(0.022)	(0.021)	(0.021)	(0.021)
Age	-0.001**	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Union	-0.006	-0.006	-0.032**	-0.035**	-0.027**	-0.029**
	(0.011)	(0.010)	(0.013)	(0.013)	(0.013)	(0.013)
Years of education	0.001	0.001	0.000	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Student	-0.029	-0.029	-0.012	-0.013	-0.007	-0.007
	(0.024)	(0.023)	(0.026)	(0.026)	(0.027)	(0.027)
HH size	-0.006***	-0.006***	-0.005**	-0.005**	-0.008***	-0.007***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
HH # adult females	0.002	0.002	0.013*	0.013*	0.007	0.007
	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)	(0.008)
HH # adult males	0.006	0.004	0.010	0.010	0.012	0.012
	(0.006)	(0.005)	(0.008)	(0.008)	(0.009)	(0.009)
HH head age	-0.000	-0.000	0.001	0.001	0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.003*	-0.003**	0.001	0.001	0.000	0.000
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
HH previous migrant	0.004	0.004	0.036***	0.038***	0.043***	0.049***
	(0.008)	(0.007)	(0.013)	(0.013)	(0.017)	(0.017)
HH loan	0.010	0.010	-0.012	-0.010	-0.012	-0.009
	(0.012)	(0.012)	(0.017)	(0.016)	(0.017)	(0.017)
HH piped water	0.019*	0.019*	0.005	-0.001	-0.026	-0.022
	(0.011)	(0.011)	(0.013)	(0.013)	(0.022)	(0.022)
HH toilet	0.003	0.003	0.005	0.008	0.001	0.004
	(0.008)	(0.008)	(0.012)	(0.011)	(0.015)	(0.016)
Com ag employment proportion	0.105	0.097	0.142*	-0.061	-0.006	-0.076
	(0.103)	(0.110)	(0.074)	(0.100)	(0.125)	(0.130)
Com bus stop	-0.023	-0.024	-0.028*	-0.030	-0.018	-0.030
	(0.019)	(0.018)	(0.016)	(0.019)	(0.023)	(0.025)
Com hospital	0.071	0.076*	-0.023	0.011	-0.028	0.012
	(0.046)	(0.044)	(0.032)	(0.054)	(0.052)	(0.056)
Com secondary school	0.017	0.019	0.011	0.030**	-0.019	-0.001
	(0.015)	(0.011)	(0.009)	(0.015)	(0.016)	(0.022)
Com market	-0.061*	-0.061*	-0.039*	-0.041*	0.010	0.009
	(0.032)	(0.031)	(0.020)	(0.024)	(0.039)	(0.044)
Mun % land irrigated	-0.000	-0.000	-0.001*	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Mun % land with maize	-0.000	-0.000	-0.002***	-0.001**	-0.001**	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	-0.000	-0.000	-0.003***	-0.002**	-0.004***	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Mun % land with wheat	0.002	0.002	0.002**	0.005**	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Mun population (10,000s of individuals)	-0.001**	-0.001**	0.001**	0.001***	0.001**	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mun economic diversity	0.130**	0.121**	0.008	0.046	-0.104	-0.056
	(0.060)	(0.056)	(0.048)	(0.051)	(0.086)	(0.082)
Mun marginalization index	0.026**	0.027**	-0.008	-0.006	-0.018	-0.013
	(0.011)	(0.011)	(0.012)	(0.017)	(0.018)	(0.025)
Mun migration intensity	0.012	0.013	-0.019	-0.019	-0.002	0.008
	(0.019)	(0.018)	(0.011)	(0.013)	(0.017)	(0.019)
State FE	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat (MP)	-	78	-	77	-	81
First stage F-stat (KP)	-	77	-	76	-	79
First stage F-stat (CD)	-	175	-	174	-	178
N	1,523	1,523	1,517	1,517	1,529	1,529
R^2	0.04	0.07	0.06	0.07	0.04	0.05
Mean of outcome variable	0.03	0.03	0.05	0.05	0.06	0.06

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (KDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.

Table A21: *Ex Ante* Male 2002-2005 Migration Outcomes [OLS & IV-2nd Stage]

	Migration					
	Intl		Domestic Lower Bound		Domestic Upper Bound	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Proportion of neighbors with crop loss (00-02)	0.024**	0.030*	-0.006	0.027	-0.008	0.044*
	(0.012)	(0.016)	(0.006)	(0.029)	(0.008)	(0.022)
HH land (ha)	-0.000	-0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH ejido	-0.027	-0.025	0.017	0.037	0.003	0.019
	(0.018)	(0.017)	(0.017)	(0.017)	(0.020)	(0.025)
HH land other	-0.027	-0.025	-0.008	-0.000	0.016	0.028
	(0.018)	(0.018)	(0.014)	(0.015)	(0.025)	(0.025)
Age	-0.003**	-0.003***	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Union	-0.014	-0.014	-0.025	-0.025	-0.017	-0.018
	(0.018)	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)
Years of education	-0.002	-0.002	0.013***	0.013***	0.012***	0.012***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Student	-0.039	-0.040	-0.043	-0.046	-0.042	-0.044
	(0.029)	(0.029)	(0.031)	(0.030)	(0.033)	(0.033)
HH size	0.001	0.001	-0.004	-0.004	-0.007*	-0.007*
	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)
HH # adult females	-0.001	-0.001	-0.014*	-0.012*	-0.022**	-0.020**
	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
HH # adult males	-0.011	-0.011	0.008	0.008	0.011	0.011
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)
HH head age	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH head education	-0.000	-0.000	-0.011***	-0.010***	-0.010***	-0.010***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
HH previous migrant	-0.003	-0.003	0.044***	0.046***	0.033***	0.031***
	(0.012)	(0.011)	(0.012)	(0.011)	(0.014)	(0.014)
HH loan	-0.018	-0.017	0.017	0.021	0.026	0.032**
	(0.019)	(0.019)	(0.016)	(0.015)	(0.017)	(0.017)
HH piped water	0.002	0.002	-0.013	-0.018	-0.029	-0.036
	(0.021)	(0.022)	(0.016)	(0.017)	(0.024)	(0.025)
HH toilet	0.018	0.019	-0.001	0.001	0.008	0.004
	(0.015)	(0.015)	(0.015)	(0.016)	(0.018)	(0.018)
Com ag employment proportion	-0.349*	-0.363**	0.202***	0.126	-0.059	-0.130
	(0.179)	(0.165)	(0.052)	(0.087)	(0.111)	(0.155)
Com bus stop	0.034	0.030	0.010	0.010	0.024	0.023
	(0.024)	(0.023)	(0.017)	(0.020)	(0.020)	(0.026)
Com hospital	0.009	0.018	-0.087*	-0.050	-0.081*	-0.023
	(0.065)	(0.070)	(0.045)	(0.054)	(0.050)	(0.071)
Com secondary school	0.052**	0.056***	0.015	0.002	-0.003	0.022
	(0.020)	(0.021)	(0.015)	(0.020)	(0.022)	(0.030)
Com market	-0.042	-0.042	0.020	0.021	0.055	0.057
	(0.036)	(0.035)	(0.022)	(0.028)	(0.034)	(0.039)
Mun % land irrigated	-0.001	-0.001	-0.001***	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Mun % land with maize	-0.001	-0.001	-0.000	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Mun % land with coffee	0.003**	0.004**	-0.003**	-0.003	-0.003**	-0.002
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Mun % land with wheat	0.008***	0.008***	0.003**	0.003**	-0.001	-0.001
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Mun population (10,000s of individuals)	0.002*	0.002*	0.001**	0.001***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
Mun economic diversity	0.036	0.042	0.086**	0.119**	-0.087	-0.035
	(0.121)	(0.110)	(0.039)	(0.048)	(0.065)	(0.078)
Mun marginalization index	0.008	0.009	0.014	0.017	-0.007	-0.002
	(0.019)	(0.019)	(0.010)	(0.013)	(0.014)	(0.020)
Mun migration intensity	0.035	0.036*	-0.017**	-0.007	-0.013	0.003
	(0.035)	(0.021)	(0.007)	(0.011)	(0.011)	(0.017)
State FX	Yes	Yes	Yes	Yes	Yes	Yes
First stage *F*-stat (MP)	-	47	-	66	-	47
First stage *F*-stat (KP)	-	66	-	65	-	45
First stage *F*-stat (CD)	-	178	-	177	-	182
N	1,396	1,396	1,393	1,393	1,413	1,413
R^2	0.08	0.13	0.08	0.28	0.07	0.06
Mean of outcome variable	0.06	0.06	0.05	0.05	0.07	0.07

Notes: * p<0.10, ** p<0.05, *** p<0.01. Standard errors clustered at municipality level in parentheses. Fixed effects for 12 states. Community crop loss is the proportion of other households in the community reporting catastrophic crop loss. Community crop loss is instrumented for by the total temperature spell interaction (divided by 100), which is defined as the interaction between the total # of days for the max spell where the daily temp Z-score > +1SD (deviations) and the total # of days for the max spell where the daily temp > 30 (EDD) in each year. First-stage F-stats: MP = Montiel-Pflueger, KP = Kleibergen-Paap and CD = Cragg-Donald.