Climatic Roots of Loss Aversion

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Abstract

This research explores the origins of loss aversion and the variation in its prevalence across regions, nations and ethnic group. It advances the hypothesis and establishes empirically that the evolution of loss aversion in the course of human history can be traced to the adaptation of humans to the asymmetric effects of climatic shocks on reproductive success during the epoch in which subsistence consumption was a binding constraint. Exploiting regional variations in the vulnerability to climatic shocks and their exogenous changes in the course of the Columbian Exchange, the research suggests that consistent with the predictions of the theory, individuals and ethnic groups that are originated in regions marked by a greater climatic volatility have a higher predisposition toward loss-neutrality, while descendants of regions in which climatic conditions tended to be spatially correlated, and thus shocks were aggregate in nature, are characterized by a greater intensity of loss aversion.

Keywords: loss aversion, cultural evolution, evolution of preferences, natural selection, Malthusian epoch, growth, development

JEL Classification: D81, D91, Z10, O10, O40

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1 Introduction

The intriguing phenomenon of loss aversion has been central for the understanding of human behavior in the past few decades. The predisposition of individuals to asymmetrically view losses and gains have been documented in a wide range of experimental and empirical studies (Tversky and Kahneman, 1991; Kahneman et al., 1991; Benartzi and Thaler, 1995) and their remarkable implications have been established in the economic, political and social arenas.[1] Nevertheless, despite the importance of this phenomenon for the understanding of human and social behavior, and conceivably in the exploration of the roots of comparative economic development across the globe, the origins of loss aversion and the variation in its intensity across societies have remained largely obscured.

This research explores the roots of loss aversion and the variation in its prevalence across regions, nations, and ethnic groups. It advances the hypothesis and establishes empirically that the evolution of loss aversion in the course of human history reflects the adaptation of humans to an ancestral environment in which, in light of the existence of a binding subsistence consumption constraint, adverse climatic shocks could have resulted in extinction, while favorable ones generated only temporary gains in reproductive success.

The study develops an evolutionary theory that captures the fundamental asymmetry that the Malthusian environment generated with respect to the attitude of individuals towards gains and loses in productivity, and thus with respect to the evolution of loss aversion. In light of existing evidence that resources per capita during the Malthusian era were near the subsistence consumption level, lineages who were subjected to significant adverse productivity shocks during this period became extinct, while those who had experienced transitory favorable climatic conditions had a larger reproductive success only temporarily (Ashraf and Galor, 2011). Thus, in view of the subsistence consumption constraint, individuals who were characterized by loss aversion had chosen to engage in safe agricultural practices that secured their subsistence consumption and minimized the risk of catastrophic realizations that would inevitably bring their dynasties to extinction. In contrast, individuals with greater propensity towards loss-neutrality may have favored riskier agricultural practices that were associated with higher expected return as well as higher expected extinction.

In a Malthusian environment in which climatic shocks are aggregate in nature, individuals who were engaged in risky agricultural practices would have likely been affected by a catastrophic climatic realization that could have brought them to extinction. Hence, in an environment that is largely characterized by aggregate productivity shocks, the trait of loss aversion and the associated choice of the safer production mode would have been favored by the forces of natural selection and would have dominated the population in the long run. Furthermore, in a Malthusian environment characterized by greater climatic volatility, although the trait of loss aversion would have still maximized the survival probability of each dynasty, loss-neutral dynasties who had experienced a sequence of (unlikely) realizations of favorable climatic conditions had a significantly higher reproductive success and have ultimately dominated the population in the long run.

[1] Jervis (1992), Levy (1996), Barberis and Huang (2001), Genesove and Mayer (2001), Shalev (2002), Fisher and Montalto (2011).

The theory generates two fundamental testable predictions about the climatic origins of the observed predisposition toward loss-aversion. It suggests that individuals, as well as societies, that are originated in regions of the world in which climatic shocks tended to be spatially correlated, and thus aggregate in nature, would be characterized by a greater intensity of loss aversion. In contrast, descendants of regions of the world that were characterized by a greater climatic volatility will tend to exhibit a higher degree of loss-neutrality.

Exploiting variations in the degree of loss aversion among second generation migrants in Europe and the US as well as across precolonial ethnic groups and modern countries, the research suggests that consistent with the predictions of the theory, individuals and ethnic groups that are originated in regions in which climatic conditions tended to be spatially correlated, and thus shocks were aggregate in nature, are characterized by a greater intensity of loss aversion, while descendants of regions characterized by a greater climatic volatility have higher propensity towards loss-neutrality.

The empirical analysis is conducted at different layers that are designed to determine the robustness of the findings in distinct samples and units of analysis. It exploits variation in preferences and behavior across individuals, countries and ethnic groups, based on the European Social Survey (ESS), General Social Survey (GSS), cross-country sample, World Value Survey (WVS), the Ethnographic Atlas (EA), and the Standard Cross Cultural Sample (SCCS). In particular, the analysis explores: (i) variation in loss-aversion across second-generation migrants in the US as well as Europe, accounting for time-invariant host country fixed effects, potentially confounding geographical characteristics of the parental countries of origin, as well as migrants' individual characteristics such as age, gender, income and education; (ii) variation in experimentally obtained measures of loss aversion across a sample of countries, accounting for a wide range of potentially confounding geographical characteristics and regional fixed effects; (iii) variation in loss-aversion across individuals within each country, accounting for a wide range of potentially confounding geographical characteristics, regional fixed effects, as well as individual characteristics, such as age, gender, income and education; (iv) variation in loss-aversion across precolonial ethnic groups, accounting for potentially confounding regional fixed effects, geographical characteristics as well as ethnographic characteristics such as the intensity of agriculture, settlement structure, the use of the plow.

In the light of the predictions of the theory, the prevalence of loss aversion is linked to intertemporal climatic volatility as well as spatial correlation in climatic conditions. A-priori one could have captured these climatic characteristics using either temperature or precipitation. However, as established in the empirical section, while productivity in the Malthusian era is significantly correlated with various characteristics of temperature, it is orthogonal to the corresponding measures of precipitation. Thus the proposed hypothesis is examined based on the impact of measures of intertemporal temperature volatility, as well as spatial correlation in temperature on the intensity of loss aversion.[2] In particular, these measures are constructed based on monthly temperatures over the period 1900-2000, using the $0.5° \times 0.5°$ resolution of the Climatic Research Unit (CRU). Moreover, the study

[2]Loss aversion is indeed affected by the various measures of temperature rather than by the corresponding measures of precipitation.

demonstrates the robustness of the results for the use of temperature volatility over the periods 500CE - 2000CE and 500CE - 1000CE.[3]

Variations in the prevalence and the distribution of loss-aversion across individuals is captured by a variety of newly introduced measures of the intensity of loss aversion. Exploiting the ESS, GSS and the WVS, the degree of loss aversion is captured by individual's ranking of potential job characteristics. In particular, preference for job security over other characteristics such as salary and promotion opportunities are used as a proxy for loss-aversion. Since conceivably a layoff is typically only a transitory phenomenon, preferences for job security over higher salary do not simply represent the trade-off between potential gains and loss of income, and thus risk aversion, but rather the reluctance of individuals to lose something that is in their possession, and thus loss aversion. Importantly, the proposed proxy measure of the intensity of loss aversion is validated using the experimental data.

The country level distribution of loss aversion is based on an experimental evidence from 2939 subjects across 30 countries, in which participants evaluate a number of prospects over gains and losses, conducted by l'Haridon and Vieider (2019). Finally, differences in the prevalence and the distribution of loss-aversion across ethnic groups are captured by two ethnographic characteristics reported by the EA and the SCCS. In particular, loss aversion is captured by parental preferences for sleeping in closed proximity to their infants; an overly cautious behavior driven by the fear of losing a child during his sleep, despite the low probability associated with this event. Alternatively, loss aversion is captured by the prevailing types of games played by members of an ethnic group. In particular, loss aversion among members of the ethnic group is reflected by the prevalence of games that are predominantly strategy-based, rather than those governed by chance.

The first part of the empirical analysis explores the effect of intertemporal temperature volatility and temperature spatial correlation on the preferences of second-generation migrants in Europe and the US for job security versus salary and other characteristics, as reported by the ESS and the GSS. In line with the predictions of the theory, the analysis establishes: (i) a statistically and economically significant adverse effect of temperature volatility in the parental country of origin on the degree of loss aversion among second-generation migrants, and (ii) a statistically and economically significant positive effect of temperature spatial correlation in the parental country of origin on the degree of loss aversion among second-generation migrants. Moreover, consistent with the proposed theory that underlines the role of intergenerational transmission in the evolution of loss aversion, the estimated effects of temperature volatility and spatial correlation in the parental country of origin (rather than those in country of residence) on loss aversion, capture the culturally-embodied, intergenerationally-transmitted effect, rather than the direct effect of geography. Furthermore, the findings are robust to the inclusion of country-of-birth fixed effects, and for accounting for the potentially confounding effects of a wide range of geographical characteristics at the parental country of origin, the years elapsed since the parental country transitioned to agriculture, and a range

[3] Potential concerns about changes in climate over the course of human history that is relevant for the evolution of loss aversion, appears are largely misplaced. As established in the empirical section, climatic volatility and temperature spatial correlation over the past 100 year period are highly correlated with the corresponding climatic characteristics in the past 2000 years.

of individual characteristics, such as age, gender, education and income.

The results are further robust to a large number of placebo and robustness tests. In particular, the analysis suggests that intertemporal temperature volatility and temperature spatial correlation have no effect on the valuation of job characteristics that are orthogonal to the loss aversion (e.g., salary vs. promotion). Moreover, while loss aversion may be correlated with other cultural dimensions (e.g., obedience, altruism, attitudes towards equality and preference for strong government), the climatic conditions that governed the evolution of loss aversion, do not have an effect on the evolution of these cultural traits as well as others (e.g., long term orientation, attitudes towards gender roles and tradition). In particular, lending further credence to the hypothesis that the geographical origins of loss aversion are distinct from those of risk aversion, temperature volatility and temperature spatial correlation are not associated with the attitude toward risk aversion, and the propensity towards risk aversion has no impact on the effect of the climatic characteristics on loss aversion.

The second part of the empirical analysis utilizes the experimental data of l'Haridon and Vieider (2019) to analyze the effect of intertemporal volatility and spatial correlation in temperature on country-level estimates of loss aversion. The results are consistent with the predictions of the theory and are robust to controlling for the potentially confounding effects of geographic characteristics and regional fixed effects.

The third part of the empirical analysis focuses on the effect of temperature intertemporal volatility and spatial correlation on the variation in loss-aversion across individuals within each country, as reported by the WVS. These results further support the proposed theory. They illustrate a statistically and economically significant negative association between temperature volatility and the degree of loss aversion among individuals, and a statistically and economically significant positive association between temperature spatial correlation and loss aversion, as captured by their preferences of job security versus other characteristics. The findings are robust to the inclusion of region-of-birth fixed effects, and for accounting for the potentially confounding effects of a wide range of geographical characteristics, as well as individual characteristics, such as age, gender, education and income. Importantly, the results are qualitatively unaffected if one adjusts the climatic variables for the ancestral composition of the contemporary population, reinforcing the hypothesized intergenerationally-transmitted and culturally-embodied nature of the effect.

The fourth part of the empirical analysis explores the effect of idiosyncratic and aggregate components of climatic shocks on the degree of loss aversion across precolonial ethnic groups. In particular, it demonstrates a statistically and economically significant negative association between temperature volatility and loss aversion and a statistically and economically significant positive association between temperature spatial correlation and loss aversion, as reported by the EA. Moreover, placebo tests demonstrate that this climatic conditions are not associated with a wide range of other ethnographic characteristics, such as sex taboos, political integration, inherited property rights, gender roles in agriculture, attitude toward premarital sex and belief in the evil eye. Thus, in line with the proposed theory, this evidence suggests that the hypothesized evolutionary process had matured already in the precolonial period.

Moreover, the ethnic level analysis permits the exploration of the effect that climatic conditions have on the degree of loss aversion, as captured by the observed human behavior. First the study explores the association between climatic characteristics, and their hypothesized impact on loss aversion, and the degree of diversification in the production of subsistence consumption. A-priori, one would have expected, that in a more volatile environment the degree of diversification will be larger. Nevertheless, the findings suggest that ethnic groups that are characterized by a greater climatic volatility tend to diversify less, reflecting the selection of loss-neutrality in a volatile environment, and thus production choices that are based on higher rates of return rather than loss-avoidance. Second, the study examines the association between climatic characteristics, and their hypothesized impact on loss aversion, and the choices of crops that are potentially less vulnerable to climatic fluctuations. In particular, due to the greater resistance of roots and tubers, in comparison to cereals, to climatic volatility, one would have expected, a-priori, that roots and tubers would be adopted in a more volatile environment. Nevertheless, the findings suggest that, among ethnic-groups that were situated in a regions with a greater temperature volatility, roots or tubers are less likely to be the dominating crops, reflecting the selection of the trait of loss-neutrality in a volatile environment and thus choices that are based on higher rates of return rather than loss-avoidance.

The research represents that first attempt to shed light on the geographical origins of loss aversion and the distribution of this trait across the globe. Moreover, it contributes to the understanding of the evolution of preferences (e.g., Bisin and Verdier, 2001; Galor and Moav, 2002), and the biogeographical roots of preferences (e.g., Alesina et al., 2013; Galor and Özak, 2016; Giuliano and Nunn, 2017) and comparative economic development (e.g., Diamond, 1997; Ashraf and Galor, 2011, 2013; Spolaore and Wacziarg, 2013; Mayshar et al., 2016).

In addition, the research builds upon and contributes to a large strain of literature dedicated to the evolutionary theory of risk preference and expected utility both within the field of economics (e.g., Robson, 1996; Robson and Samuelson, 2009, 2011) and outside it (e.g., McDermott et al., 2008; Zhang et al., 2014; Hintze et al., 2015). It focuses on the evolution of a different attitude toward uncertainty, loss aversion, within a historical context of a Malthusian economy under a subsistence consumption constraint, which governed the evolutionary pressure that humanity had confronted for most of its existence, producing testable predictions regarding the global distribution of loss aversion.

2 An Evolutionary Theory of Loss Aversion

This section advances an evolutionary theory that captures the critical role of climatic forces in the evolution of loss aversion in the course of human history. The theory suggests that the contemporary distribution of the intensity of loss aversion across individuals can be traced to the adaptation of their ancestral populations to the climatic forces that affected their productivity during Malthusian era.[4]

The model captures the fundamental asymmetry that the Malthusian environment has generated with respect to the attitude of individuals toward gains and loses in productivity, and thus with respect to the evolution of loss aversion. In light of existing evidence that resources per capita during the Malthusian era were near the subsistence consumption level, lineages of individuals who were subjected to significant adverse transitory productivity shocks during this period had become extinct, while lineages of individuals who had experienced favorable climatic realization had a larger reproductive success only temporarily (Ashraf and Galor, 2011; Vollrath, 2011; Dalgaard and Strulik, 2015). Hence, in view of constraining effects of the subsistence consumption constraint during the Malthusian epoch, individuals who were characterized by loss aversion would have chosen safe agricultural practices that would assure their subsistence consumption while minimizing the risk for catastrophic realizations that would inevitably make their dynasties extinct. In contrast, individuals who had not assign asymmetric weight to gains and loses may have favored riskier agricultural practices that were associated with a higher expected return and a higher risk of extinction.

In a Malthusian environment characterized by aggregate productivity shocks, individuals who were engaged in risky agricultural practices would have eventually been affected by catastrophic climatic realization that would have become extinct. Hence, in an environment characterized by aggregate productivity shocks the trait of loss aversion, and the associated choice of the safer production mode, would have been favored by the forces of natural selection and would have dominated the population in the long run. However, in a Malthusian environment characterized by idiosyncratic shocks, although the trait of loss aversion would have still maximized the survival probability of each individual, some dynasties of individuals, who had not assigned asymmetric weight to gains and loses, would have experienced a long and (and very unlikely) realization of optimal climatic conditions. Hence, these few loss-neutral dynasties would have generated a significantly higher reproductive success and would have ultimately dominated the population in the long run.

2.1 The Basic Structure of the Model

Consider an overlapping-generations economy in a Malthusian stage of development. In every time period the economy is populated by a continuum of two-period lived individuals who are identical in all respects except for their degree of loss aversion. Loss Aversion is transmitted within each dynasty without alteration. Individuals have access to two production modes. A safe mode that generates subsistence consumption and a risky one that is associated with a higher consumption in a favorable climatic state and consumption below subsistence (i.e., leading to extinction) in an adverse climatic state. Individuals allocate their disposable income between consumption and fertility, while facing a subsistence consumption constraint. Thus, in line with the one of the main characteristics of the Malthusian epoch, richer individuals have higher reproductive success and the effect of loss aversion on the

[4] Chen et al. (2006) argue, based on evidence from capuchin monkey that loss aversion is an innate and evolutionary ancient feature of human preference.

choice of the production mode affects the composition of loss aversion in a society.

2.2 Production

In every time period two production modes are feasible in the economy: a safe mode and a risky mode. The safe mode of production is associated with hunting, gathering or the cultivation of crops that are largely insensitive to climatic conditions (e.g., roots and tubers), while the risky mode of production is associated with the cultivation of crops that generate higher expected yield but are more sensitive to climatic conditions (e.g., cereal).

The yield generated by individual i of generation t using the safe mode of production, y_{it}^s, is independent of the climatic conditions and is constant across individuals and generations.

$$y_{it}^s = \bar{y}, \tag{1}$$

where the yield under safe mode of production, $\bar{y}$, exceeds the subsistence consumption constraint (i.e., $\bar{y} > \tilde{c}$). In particular, in line with the dominating characteristics of the Malthusian epoch, this yield permits each individual to satisfy the subsistence consumption constraint and their fertility rates are at the replacement level. Hence, in the absence of technological progress, if all individuals would choose the safe mode of production, the economy will be in a Malthusian steady-state where consumption is constant at the subsistence level and population is constant as well.

In contrast, the yield generated by individual i of generation t using the risky mode of production, y_{it}^r, depends on the climatic conditions, τ_{it}, experienced in the geographical location of individual i.

$$y_{it}^r = y(\tau_{it}), \tag{2}$$

where as depicted in Figure 1, $y(\tau_{it})$ is a symmetric, strictly concave, hump-shaped function which attains its maximum at τ^*.[5] The optimal climatic conditions, τ^*, can be viewed as the ones to which crops have adapted in the long-run and hence deviations from τ^* result in a lower yield.

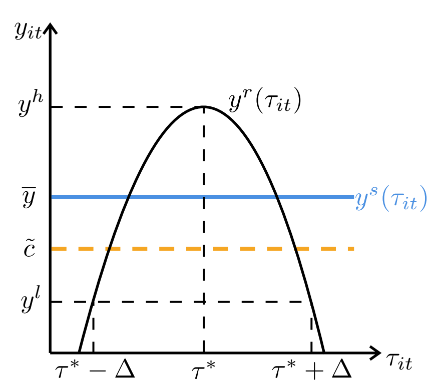

Figure 1: Crop yield as a function of temperature

[5]This feature captures the empirical reality that there is an optimal climatic conditions for crop yield, reflecting the lengthy adaptability of crops to the environment. Climatic conditions that deviate from this level reduce output. The qualitative results would not be affected if $y(\tau_{it})$ will not be symmetric or if there will be distinct good and bad realizations of climatic conditions.

In particular, an individual i in period t will experience with probability p the optimal climatic conditions, τ^*, whereas with probability $(1-p)$ the individual will experience either a positive or negative deviation of magnitude Δ from the optimal climatic conditions (e.g., sub-optimally low or high temperature). Hence,

$$\tau_{it} = \begin{cases} \tau^* - \Delta & with\, probability \quad \frac{1-p}{2} \\ \tau^* & with\, probability \quad p \\ \tau^* + \Delta & with\, probability \quad \frac{1-p}{2} \end{cases} \tag{3}$$

The yield generated by individual i of generation t using the risky mode of production, y^r_{it}, is therefore

$$y^r_{it} = y(\tau_{it}) = \begin{cases} y^h \equiv y(\tau^*) > \bar{y} & with\, probability \quad p \\ y^l \equiv y(\tau^* \pm \Delta) < \tilde{c} & with\, probability \;\; 1-p \end{cases} \tag{4}$$

Hence, an adverse climatic realization would not permit individual i who is engaged in the risky production mode to satisfy the subsistence consumption constraint, i.e., $y^l < \tilde{c}$. In contrast, a favorable climatic realization would generate a yield that is higher than the one obtained under the safe mode of production and would assure consumption above subsistence, i.e., $y^h > \bar{y} > \tilde{c}$. Moreover, $y^h \leq y^*$, where y^* is the highest level of income below which the subsistence consumption constraints binds.[6] Moreover, while the high yield realization under the risky mode of production is independent of the of magnitude of the deviation from the optimal climatic conditions, Δ, the low yield realization is negatively affected by Δ, (i.e., $\partial y^l/\partial\Delta < 0$.)

Climatic volatility is spatially correlated across individuals within a generation (while being independent over time). In particular, a fraction $\mu \in [0, 1]$ of individuals experience an identical (aggregate) realization of the climatic shock based on the distribution specified in (3), whereas a fraction $1-\mu$ experience idiosyncratic realizations based on the same distribution.[7,8]

2.3 Individuals

In every period t, a continuum I of two-period lived individuals is born. Individuals are ex-ante identical in all respects except for their degree of loss aversion with respect to consumption. The extent of loss aversion is heterogeneous within each generation and is transmitted intergenerationally, from parent to child, without alteration. The initial distribution of loss aversion across types is uniform over the existing range of the loss aversion parameter.

In the first period of their life – childhood – individuals are passive economic agents and they consume part of their parental resource. In the second period of their life - adulthood – individuals are active economic agents.

[6]As will become apparent for $y_{it} \in [\tilde{c}, y^h]$ and since $y^h \leq y^*$, individuals will consume the subsistence level of consumption, $\tilde{c}$, and hence given their budget constraint will devote the reaming income to raise $(y_{it} - \tilde{c})/(\rho y_{it})$ children.

[7]This specification assures that the idiosyncratic and the aggregate dimensions of climatic volatility are orthogonal to one another. Hence, it permits the examination of the impact of: (i) changes in cross-individual correlation of shocks (i.e., μ), holding the distribution of the shocks from point of view of individual i unchanged; (ii) changes in the climatic volatility parameter (i.e., Δ), holding the spatial correlation unchanged.

[8]The structure of shocks in the model is similar the structure of shocks in Robson (1996)'s theoretical exploration of the implications of aggregate and idiosyncratic risk for the evolution of expected utility.

Based on their degree of loss aversion, they choose their desirable mode of production, they produce, and optimally allocate the resulted yield between consumption and child rearing.[9]

In light of the association between the degree of loss aversion and the choice of the production mode, the nature of the climatic shocks determines individuals' yield and hence their reproductive success and consequently contributes to the evolution of loss aversion in the population.

2.3.1 Preferences, Constraints, and Optimization

In order the capture the forces of natural selection that operated over most of human existence, preferences reflect two of the fundamental elements of the Malthusian world: (i) utility from the number of children (reproductive success), and (ii) the presence of a subsistence consumption constraint, below which a lineage becomes extinct. Moreover, corresponding to the reference point in prospect theory, the natural reference point is the subsistence consumption constraint, below which losses will result in extinction. Namely, individuals are perfectly rational but they do not internalize the Darwinian strategy (i.e., the wishes of nature).

Individuals derive utility from consumption and fertility. The preferences of an adult individual i in period t, are represented by a utility function which captures the spirit of Tversky and Kahneman (1991). It reflects the asymmetric utility that individuals attribute to gains and losses in consumption, with respect to a reference subsistence consumption level, $\tilde{c}$, as well as concavity with respect to gains and convexity with respect to losses. In particular, the level of utility of an adult i in period t, u_{it}, is:[10]

$$u_{it} = u_i(c_{it}, n_{it}) = \begin{cases} [f(c_{it}) - f(\tilde{c})] + w(n_{it}) & if \;\; c_{it} \geq \tilde{c} \\ \frac{1}{\theta_i}[g(c_{it}) - g(\tilde{c})] + w(n_{it}) & if \;\; c_{it} < \tilde{c}, \end{cases} \tag{5}$$

where (a) the subsistence consumption constraint, $\tilde{c}$, is the natural reference point of consumption for each individual i;[11] (b) w and f are monotonically increasing concave functions, reflecting risk aversion with respect to gains, while g is monotonically increasing convex function, capturing risk loving in the range of losses, (c) $w(0) > -\infty$, and (d) $1/\theta_i \in [1, \infty)$ is the coefficient of loss aversion of individual i, where θ_i is uniformly distributed across dynasties in period 0 , i.e.,[12]

$$\theta_i \sim U(0, 1). \tag{6}$$

Consumption above subsistence, $\tilde{c}$, is considered by individuals to reflect a gain with respect to the natural reference consumption level, whereas consumption below subsistence, $\tilde{c}$, is considered by the individual to reflect a loss with

[9] while extensive temporal trade within and across communities, have taken place over the course of human history, enforceable inter-temporal contracts across distinct communities emerged only in a very late stage in human history. Coinsurance across communities may been therefore secondary for the evolution of loss aversion. (Note that within each community (i.e. within a small geographical territory) shocks are likely to be highly correlated across individuals and could not be co-insured).

[10] Appendix A demonstrates the robustness of the testable predictions of the model to various alternative forms of the utility function (i.e., loss aversion that is applicable to both consumption and fertility, differential level of constant relative risk aversion with respect to consumption and fertility, less restrictive utility function, and death associated with consumption below subsistence). The least restrictive specification is considered in the Appendix A.2.3.

[11] The choice of $\tilde{c}$ as the reference point of the utility function is a natural one in light of the asymmetric effects of climatic shocks on reproductive success around this point. Nevertheless, any reference point in the interval $(y_l; \bar{y}]$ would not affect the qualitative analysis.

[12] The qualitative analysis is unaffected if non-uniform distributions is postulated.

respect to this natural reference consumption level.[13] Hence, the parameter $\theta_i \in (0;1]$ is inversely related to the degree of the individual's loss aversion with respect to subsistence consumption.

An adult i in period t is subjected to two constraints: A budget constraint and a subsistence consumption constraint. Once the choice of the production mode is made and uncertainty is realized, an adult i in period t allocates the resulting income, y_{it}, between consumption and fertility.

$$c_{it} + \rho y_{it} n_{it} \leq y_{it}, \tag{7}$$

where $\rho > 0$ is the time cost of raising a child. Moreover, the individual faces the subsistence consumption constraint, below which individuals can survive but are unable to reproduce, i.e.,[14,15]

$$n_{it} = 0 \;\; if \;\; c_{it} < \tilde{c}. \tag{8}$$

Hence, an adult i in period t allocates the income y_{it}, between consumption, c_{it}, and fertility, n_{it}, so as to maximize the utility function $u_i(c_{it}, n_{it})$:

$$\begin{aligned} (c_{it}, n_{it}) = & \operatorname{argmax} u_i(c_{it}, n_{it}) \\ s.t. \;\; & c_{it} + \rho y_{it} n_{it} = y_{it}; \\ & n_{it} \geq 0; \;\; c_{it} \geq 0; \\ & n_{it} = 0 \;\; if \;\; c_{it} < \tilde{c}. \end{aligned} \tag{9}$$

Given the properties of the utility function, a solution to the maximization problem exists and is unique, and given the income realization, it is time independent. In particular, if $y_{it} \in [0;\tilde{c}]$, individuals will not be able to be engaged in reproduction (i.e., $n_{it} = 0$) and will therefore consume their entire yield, y_{it}. However, if $y_{it} \in [\tilde{c}, y^h]$, since $y^h \leq y^*$, the subsistence consumption constraints binds and individuals will consume the subsistence consumption, $\tilde{c}$, and given their budget constraint will devote the remaining income to raise $(y_{it} - \tilde{c})/(\rho y_{it})$ children.[16,17]

$$c_{it} = c_i(y_{it}) = \begin{cases} y_{it} & if \quad y_{it} \in [0;\tilde{c}] \\ \tilde{c} & if \quad y_{it} \in [\tilde{c}, y^h]; \end{cases} \tag{10}$$

$$n_{it} = n_i(y_{it}) = \begin{cases} 0 & if \quad y_{it} \in [0;\tilde{c}] \\ (y_{it} - \tilde{c})/(\rho y_{it}) & if \quad y_{it} \in [\tilde{c}, y^h]. \end{cases} \tag{11}$$

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[13]Interestingly, evidence suggests that birds tend to view gambles in a similar fashion above and below the subsistence consumption level (Caraco et al., 1980).

[14]Alternatively, one can assume that if consumption is below subsistence, individuals do not survive and thus do not reproduce. Similar structure of the relationship between subsistence consumption and fertility is used by Baudin et al. (2015).

[15]Differential subsistence levels for each production mode, based on the energy requirement associated with them, would have no qualitative impact as long as the basic structure of the two production modes is maintained (i.e., subsistence level associated with the safe mode does not exceed to the safe mode's output (i.e., $\tilde{c}_s \leq \bar{y}$), and the subsistence for the risky mode is between high and low realizations of risky production (i.e., $y_l < \tilde{c}_r < y_h$).)

[16]As demonstrated empirically by Ashraf and Galor (2011), this is a plausible consumption realization in the context of the Malthusian epoch.

[17]The critical level of income, y^*, below which the subsistence consumption constraint is binding, is uniquely determined by the equation: $w'[(y^* - \tilde{c})/\rho y^*)]/\rho y^* = f'(\tilde{c})$.

In particular, as follows from (9), individuals who are engaged in the safe mode of production and generate an income $\bar{y} > \tilde{c}$ would find it optimal to consume the subsistence level of consumption, and as postulated earlier, would have precisely one child. Namely, the safe yield $\bar{y}$ is assumed to be such that $\bar{y} = \tilde{c}/(1-\rho)$, permitting fertility at the replacement level (i.e., $n(\bar{y}) = (\bar{y} - \tilde{c})/(\rho\bar{y}) = 1$).[18] Accordingly, the fertility rate of individuals who are engaged in the risky mode of production and obtain a favorable climatic realization that result in a level of income of $y^h > \bar{y}$ will be therefore above replacement (i.e., $n(y^h) = (y^h - \tilde{c})/(\rho y^h) > 1$).

Consumption and the fertility are therefore a function of the individual's income (i.e., $c_{it} = c(y_{it})$ and $n_{it} = n(y_{it})$), and hence for a given income realization, the consumption and the fertility functions are identical across individuals and time.

The indirect utility function of an adult i in period t, V_{it}, is therefore

$$v_{it} = u_i(c(y_{it}), n(y_{it})) \equiv v_i(y_{it}). \tag{12}$$

2.3.2 Choice of Production Mode

Individuals choose their desirable mode of production prior to the realization of the climatic conditions. Their choice is designed to maximize their expected utility, conditional on the expected probability distribution of the climatic shocks. These choices may differ across individuals based on their degree of loss aversion.

As follows from (5),(10), and (11), the expected utility u^r_{it}, generated by adult i in period t who chooses the risky production mode, is

$$u^r_{it} \equiv \mathbb{E}\left[v_i(y^r_{it})\right] = p\left[w\left(\frac{y^h - \tilde{c}}{\rho y^h}\right)\right] + (1-p)\left[\frac{1}{\theta_i}[g(y^l) - g(\tilde{c})] + w(0)\right] \equiv u^r(\theta_i), \tag{13}$$

where since $g(y^l) < g(\tilde{c})$,

$$\lim_{\theta\to 0} u^r(\theta_i) = -\infty \quad and \quad \frac{du^r(\theta_i)}{d\theta_i} > 0 \quad \forall \theta_i \in (0;1). \tag{14}$$

Analogously, the utility, u^s_{it}, generated by adult i in period t who chooses the safe production mode is

$$u^s_{it} = w(1) \equiv u^s. \tag{15}$$

Hence, the utility generated by individuals who choose the safe production mode is constant across types and time.

Assuming that the risky production mode is sufficient attractive so as to assure that at least the most loss-neutral individuals prefers this mode of production (i.e., $u^r(1) > u^s$),[19] then it follows from (13) - (15) and the *Intermediate Value Theorem* that there exists a unique and time invariant level of the parameter of loss neutrality, $\hat{\theta} \in (0;1)$, such that $u^r(\hat{\theta}) = u^s$.

$$\hat{\theta} = \frac{(1-p)\left(g(\tilde{c}) - g(y^l)\right)}{\left[pw\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) + (1-p)w(0) - w(1)\right]} \equiv \hat{\theta}(\Delta), \tag{16}$$

where as follows from (4), $y^l = y(\tau^* \pm \Delta)$.

[18] This normalization enhances the analytical tractability of the model and has no impact on its qualitative predictions.

[19] This assumption implies that $p[w((y^h - \tilde{c})/\rho y^h)] + (1-p)\left[[g(y^l) - g(\tilde{c})] + w(0)\right] > w(1)$.

Thus, as follows from (14), (15), and (16),

$$u^r(\theta_i) \begin{cases} < u^s & \forall \theta_i \in (0, \hat{\theta}) \\ > u^s & \forall \theta_i \in (\hat{\theta}, 1]. \end{cases} \tag{17}$$

The relatively more loss averse individuals in society (i.e., $i \in I^A \equiv \{i \in I | \theta_i \in (0; \hat{\theta}]$) would choose the safe mode of production, whereas the least loss averse individuals in society (i.e., $i \in I^B \equiv \{i \in I | \theta_i \in (\hat{\theta}; 1]\}$ would choose the risky production mode. Hence, as depicted in Figure 2, since the initial distribution of θ_i is uniform, the sorting of individuals into the risky and the safe modes of production will result in an average degree of loss neutrality of $\hat{\theta}/2$ among individuals who selected the safe mode of production and an average degree of loss neutrality of $(1+\hat{\theta})/2$ among individuals who selected the risky mode of production.

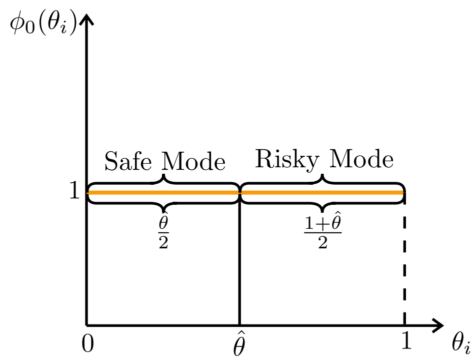

Figure 2: Sorting into the Safe and the Risky Production Modes

The figure depicts: (i) the Sorting into the safe and the risky production modes, based on the degree of loss-neutrality, θ_i; (ii) the average degree of loss-neutrality is $\hat{\theta}/2$ among individuals who choose the safe mode production and $(1+\hat{\theta})/2$, among those who choose the risky mode.

Furthermore, the cut-off level $\hat{\theta}$ is positively affected by the magnitude of the shocks Δ, (i.e., $\hat{\theta}'(\Delta) > 0$).[20] Namely, since the risky mode of production is less profitable in a more volatile environment, the level of risk-neutrality that would make individual indifferent between the two modes of production will be higher in a more volatile environment.

Hence, as depicted in Figure 3, if the degree of climatic volatility increases from Δ to $\Delta^{'}$, the critical level of θ will increase from $\hat{\theta}$ to $\hat{\theta}'$ and the average degree of loss neutrality will increase among the two groups: from $\hat{\theta}/2$ to $\hat{\theta}'/2$ among individuals who choose the safe mode of production, and from $(1+\hat{\theta})/2$ to $(1+\hat{\theta}')/2$ among individuals who choose the risky mode of production.

[20] Note that the effect of climatic volatility Δ on the cut-off level of loss neutrality $\hat{\theta}$ is orthogonal to the degree of spatial correlation in these shocks, μ.

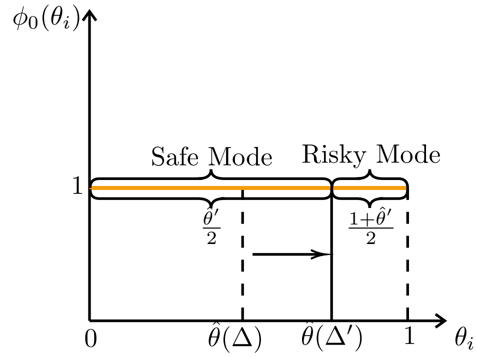

Figure 3: The Effect of Climatic Volatility on Sorting

The figure depicts: (i) the contribution of an increase in climatic volatility from Δ to $\Delta^{'}$ to the rise in the cut-off level from $\hat{\theta}(\Delta)$ to $\hat{\theta}(\Delta^{'})$; (ii) the increase in the average degree of loss-neutrality in the two groups to $\hat{\theta}^{'}/2$ and $(1+\hat{\theta}^{'})/2$.

The yield of an adult i of generation t is therefore

$$y_{it} = \begin{cases} y^l & \textit{with probability } (1-p) \quad \textit{if} \quad \theta_i \geq \hat{\theta} \\ y^h & \textit{with probability } \quad p \quad \textit{if} \quad \theta_i \geq \hat{\theta} \\ y^s_{it} = \bar{y} \quad \textit{if} \quad \theta_i \leq \hat{\theta}, \end{cases} \tag{18}$$

and the level of fertility is:

$$n_{it} = \begin{cases} 0 & \textit{if} \quad \theta_i > \hat{\theta} \ \textit{and} \ y_{it} = y^l \\ \frac{y_{it}-\tilde{c}}{\rho y_{it}} > 1 & \textit{if} \quad \theta_i > \hat{\theta} \ \textit{and} \ y_{it} = y^h \\ 1 & \textit{if} \quad \theta_i \leq \hat{\theta}. \end{cases} \tag{19}$$

Moreover, since climatic volatility is spatially correlated across individuals within a generation (while being independent over time), (i.e., since a fraction $\mu \in [0,1]$ of individuals experience an identical (aggregate) realization of the climatic shock based on the distribution specified in (3), whereas a faction $1-\mu$ experience idiosyncratic realizations based on the same distribution), the distribution of fertility across individuals who are engaged in the risky production mode (i.e, individuals whose $\theta_i > \hat{\theta}$) is:

$$n_{it} = \begin{cases} n^{id}_{it} & \textit{with probability} \quad 1-\mu \\ n^{ag}_{t} & \textit{with probability} \quad \mu. \end{cases} \tag{20}$$

The fertility rate of individuals who experience an idiosyncratic realization of the climatic shock, n^{id}_{it}, as well as those who experience an aggregate realization, n^{ag}_{t}, are identically distributed. In particular,

$$n^{id}_{it} = \begin{cases} 0 & \textit{with probability} \quad 1-p \\ \frac{y^h-\tilde{c}}{\rho y^h} & \textit{with probability} \quad p. \end{cases} \tag{21}$$

independent, for each individual i who experience idiosyncratic realization of the shock, whereas for all individuals that experience an aggregate shock,

$$n_t^{ag} = \begin{cases} 0 & with\,probability \quad 1-p \\ \frac{y^h - \tilde{c}}{\rho y^h} & with\,probability \quad p. \end{cases} \tag{22}$$

2.4 The Evolution of the Composition of Loss Aversion

The evolution of the composition of loss aversion is governed by the effect of loss aversion on the differential reproductive success across individual. Since loss aversion is assumed to be transmitted intergenerationally within each dynasty i without any alteration, if a greater propensity towards loss aversion is associated with a higher income, and thus higher reproductive success, then loss aversion will become more prevalent in the population in the long-run.[21]

As followed in (16), the threshold level of the parameter of loss aversion, $\hat{\theta}$, below which individuals are engaged in the safe production mode is constant and is time invariant. Moreover, as illustrated in (19), individuals whose $\theta_i \leq \hat{\theta}$ (i.e., members of group A) have identical fertility rate (i.e., $n_{it} = 1$ if $\theta_i \leq \hat{\theta}$), while the fertility rates of individuals whose $\theta_i > \hat{\theta}$, (i.e., members of group B) is identically distributed based upon the expression in I (20) and (21). Hence, the distribution of loss aversion within each of the two groups has no effect on the aggregate fertility within each of the groups.

Nevertheless, differential fertility rates across the two groups affect the relative sizes of the two groups, their representation of in the population, and thus the evolution of distribution of loss aversion in the population as a whole.

The total population in the economy in period t. N_t is decomposed into members of group A, N_t^A, and member of group B, N_t^A, i.e.,

$$N_t^A + N_t^B = N_t. \tag{23}$$

Hence, since the initial distribution of types i is uniform over the entire feasible domain of θ_i, (i.e., since $\theta_i \sim U(0,1])$, it follows that

$$\begin{aligned} N_0^A &= \hat{\theta} N_0; \\ N_0^B &= (1-\hat{\theta}) N_0. \end{aligned} \tag{24}$$

Moreover, since this distribution remains intact over time due to the stationarity of $\hat{\theta}$, the evolution of the size population of group A from period $t-1$ to period t, is governed by the difference equation

$$N_t^A = \left[\int_{i \in \{i | \theta_i \leq \hat{\theta}\}} n_{it} di \right] N_{t-1}^A. \tag{25}$$

Hence, as follows from (19), $n_{it} = 1$, and the size of the population of group A in period t, noting (24), is constant

[21] One can interpret the preference of individual i, as reflecting the collective preference of community i,in which case selection will be at the societal level.

over time.

$$N_t^A = \left[\prod_{s=1}^{t} \int_{i \in \{i|\theta_i \le \hat{\theta}\}} n_{is} di \right] N_0^A = \hat{\theta}(\Delta) N_0 \equiv N^A(\hat{\theta}(\Delta)). \tag{26}$$

where as follows from (26) and (16), $dN_t^A/d\Delta > 0$.

Similarly, the evolution of the size of the population of group B from period $t-1$ to period t, is governed by the difference equation

$$N_t^B = \left[\int_{i \in \{i|\theta_i > \hat{\theta}\}} n_{it} di \right] N_{t-1}^B. \tag{27}$$

Hence, in view of the spatial distribution of n_{it} $\forall\, i \in \{i|\theta_i > \hat{\theta}\}$, as specified in (20) and (21), the population of group B in period t, noting (24), is

$$\begin{aligned} N_t^B &= \prod_{s=1}^{t} \left[\int_{i \in \{i|\theta_i > \hat{\theta}\}} n_{is} di \right] N_0^B = \prod_{s=1}^{t} \left[(1-\mu) \int_{i \in \{i|\theta_i > \hat{\theta}\}} n_{is}^{id} di + \mu n_s^{ag} \right] N_0^B \\ &= \prod_{s=1}^{t} \left[(1-\mu) p \frac{y^h - \tilde{c}}{\rho y^h} + \mu n_s^{ag} \right] (1-\hat{\theta}) N_0 \equiv N_t^B(\hat{\theta}(\Delta), \mu), \end{aligned} \tag{28}$$

where $\partial N_t^B/\partial \Delta < 0$ (since $\partial N_t^B/\partial \hat{\theta} < 0$ and $\hat{\theta}'(\Delta) > 0$).

The share of the less loss averse individuals in the population who choose the risky mode of production (i.e., the share of group B in the population) in period t, β_t, is

$$\beta_t \equiv \frac{N_t^B}{N_t^A + N_t^B} \equiv \beta_t(\hat{\theta}(\Delta), \mu). \tag{29}$$

where as follows (26) and (28), $\partial \beta_t/\partial \Delta < 0$.

Given the uniform distribution of loss aversion in the population in time 0, and since this distribution remains intact over time due to the stationarity of $\hat{\theta}$, the average level of loss aversion in the population in period t, $\bar{\theta}_t$, is

$$\begin{aligned} \bar{\theta}_t &= \beta_t \mathbb{E}(\theta|\theta \in (\hat{\theta}; 1]) + (1-\beta_t)\mathbb{E}(\theta|\theta \in (0; \hat{\theta}]) \\ &= \beta_t \frac{1+\hat{\theta}}{2} + (1-\beta_t)\frac{\hat{\theta}}{2} = \frac{\beta_t + \hat{\theta}}{2} \equiv \bar{\theta}_t(\hat{\theta}(\Delta), \mu), \end{aligned} \tag{30}$$

where as follows from (29), $\partial \bar{\theta}_t/\partial \Delta$ is ambiguous.

The asymptotic share of the less loss averse individuals in the population who choose the risky mode of production (i.e., $\lim_{t\to\infty} \beta_t$,) is determined by the relative long run reproductive success and therefore by the asymptotic rate of population growth, n^j, of each of group. Since $N_t^j = (n^j)^t N_0^j$, if population growth is constant at a rate n^j,

$$\bar{n}^j = \lim_{t\to\infty} \frac{1}{t} log N_t^j; \quad j = A, B, \tag{31}$$

Hence, as follows from (26), the asymptotic rate of population growth of the more loss averse group, A, is

$$\bar{n}^A = 0. \tag{32}$$

reflecting the fact that population of this group is constant overtime.

Similarly, the asymptotic rate of population growth of the less loss averse group, B, as follows from (28), is

$$\bar{n}^B = \text{plim}_{t\to\infty}\frac{1}{t}\sum_{s=1}^{t}\log[(1-\mu)p\frac{y^h-\tilde{c}}{\rho y^h}+\mu n_s^{ag}]+\lim_{t\to\infty}\frac{1}{t}\log((1-\hat{\theta})N_0). \tag{33}$$

Hence, since as t approaches infinity the *Law of Large Numbers* applies,

$$\begin{aligned}
\bar{n}^B &= \mathbb{E}\log\left[(1-\mu)p\frac{y^h-\tilde{c}}{\rho y^h}+\mu n_s^{ag}\right] = \\
&= p\log\left[(1-\mu)p\frac{y^h-\tilde{c}}{\rho y^h}+\mu\frac{y^h-\tilde{c}}{\rho y^h}\right]+(1-p)\log\left[(1-\mu)p\frac{y^h-\tilde{c}}{\rho y^h}\right] = \\
&= p\log\left[\mu+(1-\mu)p\right]+(1-p)\log\left[(1-\mu)p\right]+\log\left(\frac{y^h-\tilde{c}}{\rho y^h}\right)\equiv\bar{n}^B(\mu),
\end{aligned} \tag{34}$$

where

$$\bar{n}^B(1) = -\infty \quad and \quad \frac{d\bar{n}^B(\mu)}{d\mu} < 0. \tag{35}$$

Since $\bar{n}^B(0) > \bar{n}^A = 0$, as follows from the assumption that the mean return in the risky mode of production is higher than in the safe mode of production (i.e., $u^r(1) > u^s$), it follows from (35) and from the *Intermediate Value Theorem*, that there exists a unique $\hat{\mu}\in(0;1)$ such that

$$\begin{aligned}
\bar{n}^B(\mu) > \bar{n}^A = 0 \qquad &for \quad \mu<\hat{\mu}; \\
\bar{n}^B(\hat{\mu}) = \bar{n}^A = 0 \qquad &for \quad \mu=\hat{\mu}; \\
\bar{n}^B(\mu) < \bar{n}^A = 0 \qquad &for \quad \mu>\hat{\mu}.
\end{aligned} \tag{36}$$

Hence, the asymptotic share, $\bar{\beta}$, of individuals who choose the risky mode of production is

$$\bar{\beta} = \beta(\hat{\theta},\mu) = \begin{cases} 0 & if \ \ \mu>\hat{\mu} \\ 1-\hat{\theta} & if \ \ \mu=\hat{\mu} \\ 1 & if \ \ \mu<\hat{\mu} \end{cases} \tag{37}$$

and the average level of loss neutrality in the population in the long run, $\bar{\theta}$, as follows from (30), is

$$\bar{\theta}\equiv\lim_{t\to\infty}\bar{\theta}_t = \frac{\beta(\hat{\theta},\mu)+\hat{\theta}}{2} = \bar{\theta}(\hat{\theta}(\Delta),\mu) = \begin{cases} \frac{\hat{\theta}}{2} & if \quad \mu>\hat{\mu} \\ \frac{1}{2} & if \quad \mu=\hat{\mu} \\ \frac{1+\hat{\theta}}{2} & if \quad \mu<\hat{\mu}, \end{cases} \tag{38}$$

Hence, noting that $\hat{\theta}'(\Delta) > 0$, for $\mu\neq\hat{\mu}$

$$\frac{\partial\bar{\theta}(\hat{\theta}(\Delta),\mu)}{\partial\Delta} > 0. \tag{39}$$

In particular, as depicted in Figure 4, as long as the degree of correlation in the shocks is relatively small (i.e., $\mu<\hat{\mu}$), the share of relatively loss-neutral individuals (i.e., those who choose the risky mode of production) in the population increases (panel a), reaching asymptotically a complete domination (panel b). Moreover, since reproduction success within this group is independent of the degree of loss-aversion, the average level of loss-neutrality in this group is not changing over time, remaining constant at its initial level, $(1+\hat{\theta})/2$, and thus the asymptotic average level of loss-neutrality in the population, $\bar{\theta}$, is just the average loss-neutrality among individuals who choose the risky mode production, $(1+\hat{\theta})/2$.

(a) Distribution of Loss Neutrality in period 1 (b) Asymptotic distribution of Loss Neutrality

Figure 4: Evolution of Loss Aversion in the population under weakly correlated climatic shocks (i.e., $\mu < \hat{\mu}$)

In contrast, as depicted in Figure 5, as long as the degree of correlation in the shocks is relatively large (i.e., $\mu > \hat{\mu}$), the share of relatively loss-neutral individuals (i.e., those who choose the safe mode of production) in the population increases (panel a), reaching asymptotically a complete domination (panel b). Moreover, since reproduction success within this group is independent of the degree of loss-aversion, the average level of loss-neutrality in this group is not changing over time, remaining constant at its initial level, $\hat{\theta}/2$, and thus the asymptotic average level of loss-neutrality in the population, $\bar{\theta}$, is just the average loss-neutrality among individuals who choose the risky mode of production, $\hat{\theta}/2$.

(a) Distribution of Loss Neutrality in period 1 (b) Asymptotic distribution of Loss Neutrality

Figure 5: Evolution of Loss Aversion in the population under strongly correlated climatic shocks (i.e., $\mu > \hat{\mu}$)

Moreover, as depicted in Figure 3, if the degree of climatic volatility increases from Δ to $\Delta^{'}$, the critical level of θ will increase from $\hat{\theta}$ to $\hat{\theta}'$ and the average degree of loss neutrality will increase among the two groups: from $\hat{\theta}/2$ to $\hat{\theta}'/2$ among individuals who choose the safe mode of production, and from $(1+\hat{\theta})/2$ to $(1+\hat{\theta}')/2$ among individuals who choose the risky mode of production. Hence, regardless of the degree of correlation in the shocks, volatility will increase the degree of loss-neutrality in the long-run. In particular, as depicted in Figure 6 if the degree of correlation in the shocks is relatively small (i.e., $\mu < \hat{\mu}$), the dominating type in the long-run are individuals who are engaged in the risky mode of production and volatility will increase the average degree of loss-neutrality from from $(1+\hat{\theta})/2$ to $(1+\hat{\theta}')/2$ (panel a), whereas if the degree of correlation in the shocks is relatively large (i.e., $\mu > \hat{\mu}$), the dominating type in the long-run are individuals who are engaged in the safe mode of production, and yet again, volatility will increase the average degree of loss-neutrality from $\hat{\theta}/2$ to $\hat{\theta}'/2$ (panel b).

(a) Weakly correlated shocks ($\mu < \hat{\mu}$)

(b) Strongly correlated shocks ($\mu > \hat{\mu}$)

Figure 6: Effect of the increased climatic volatility on the asymptotic distribution of Loss Neutrality and long-run average level of Loss Neutrality in the population.

2.5 Testable Implications

In order to derive the testable implication of the theoretical model, suppose that each geographical region, r, is populated by a continuum of groups of individuals. Suppose further that the spatial auto correlations in climatic shocks differ across these groups and their geographical locations and is characterized by a non-trivial distribution μ_r with *cumulative distribution function* $F_{\mu_r}(\mu)$. In particular, an increase in μ by $d\mu$ corresponds to the uniform shift of the entire distribution to the right, resulting in a new distribution $\mu_r' \equiv \mu_r + d\mu$ with a *cumulative distribution function* $F_{\mu_r'}(\mu) = F_{\mu_r}(\mu - d\mu)$.

The average $\bar{\theta}$ in the region r is therefore

$$\bar{\theta}_r \equiv \mathbb{E}_{\mu_r'}(\bar{\theta}(\hat{\theta}, \mu)) = \frac{\hat{\theta}}{2}(1 - F_{\mu_r}(\hat{\mu} - d\mu)) + \frac{1+\hat{\theta}}{2} F_{\mu_r}(\hat{\mu} - d\mu) = \frac{F_{\mu_r}(\hat{\mu} - d\mu) + \hat{\theta}}{2}, \tag{40}$$

where as follows from the fact that $F_{\mu_r}(\mu)$ is non-decreasing, $\partial\bar{\theta}_r/\partial d\mu \leq 0$.

Hence, as follows from (39), (40), the testable predictions of the model are:

Proposition 2.1. *If the economy is characterized by:*

(i) a higher spatial correlation of climatic shocks, μ, the average level of loss aversion that will be observed in the economy in the long run, $[1/\bar{\theta}]$, will be higher.

(ii) a higher volatility of climatic shocks, Δ, the average level of loss aversion that will be observed in the economy in the long run, $[1/\bar{\theta}]$, will be lower.

Thus, the theory suggests that individuals and societies that are originated in regions of the world in which climatic shocks tended to be spatially correlated, and thus aggregate in nature, would be characterized by a greater intensity of loss aversion, while descendants of regions that were characterized by idiosyncratic climatic shocks will tend to be more loss-neutral and to assign more symmetric weights to gains and losses.

2.6 Additional Findings

2.6.1 Climate and the Evolution of Risk Aversion vs. Loss Aversion

As demonstrated in Appendix A.1, the testable predictions about the effect of climatic characteristics on the evolution of loss aversion, as presented in the baseline model, are not applicable to the evolution of constant relative risk aversion. In particular:

(a) if the subsistence consumption constraint is either absent or not binding (i.e., in the absence of a reference point), the long-run level of the parameter of constant relative risk-aversion is independent of the climatic characteristics.

(b) If the subsistence consumption constraint is binding, in contrast to the evolution of loss-aversion, the prevalence of higher constant relative risk aversion may be affected positively by climatic volatility and negatively by the spatial correlation in climatic shocks.

(c) There is no systematic relationship between climatic characteristics and the evolution of the parameter of constant relative risk aversion.

2.6.2 Robustness to Alternative Forms of Utility Function

Appendix A.2 demonstrates that the theoretical predictions are robust to the use of the utility function in which:

(a) loss aversion with respect to fertility is present;

(b) differential level of constant relative risk aversion with respect to consumption and fertility are assumed;

(c) consumption below subsistence is associated with death;

(d) more general functional form is assumed;

(e) concavity with respect to losses is present;

(f) the reference point adjusts to changes in the subsistence level.

2.6.3 Evolution of other Features of the Utility Function

Appendix A.2 demonstrates that under some conditions:

(a) convexity with respect to losses emerges as an evolutionary dominant feature of the utility function;

(b) adaptation of the reference point to changes in the subsistence consumption level emerges as an evolutionary dominant feature of the utility function.

2.6.4 Imperfect Intergenerational Transmission of Predisposition towards Loss Aversion

Appendix A.3 demonstrates the robustness of the results to the imperfect intergenerational transmission of predisposition towards loss aversion. In particular, it considers possibility that a child will inherit the weighted average of the parental predisposition towards loss aversion and a societal one.

2.7 Interpretations of the Predictions of the Model

Consider a continuum of individuals that are positioned on the edge of an evolutionary cliff (i.e., a subsistence consumption constraint). Suppose that these individuals span the entire spectrum of loss aversion – from loss-neutrality to an infinite level of loss-aversion. Individuals who are sufficiently loss-averse, would choose the safe mode of production in order to avert the likelihood of dropping from the evolutionary cliff and the subsequent extinction of their dynasty. Their choice of the safe mode of production would assure each of these individuals the subsistence level of consumption as well as one surviving offspring. Hence each of these dynasties would survive indefinitely although the size of a group as a whole would remain constant over time.

In contrast, a continuum of (sufficiently) loss-neutral individuals, who are less concerned about dropping from the evolutionary cliff, and the subsequent extinction of their dynasty, would choose the risky mode of production. As long as those individuals would experience independent (idiosyncratic) climatic shocks, while a fraction *1-P* of the group would become extinct in the initial period, with probability one, a portion of the remaining fraction would experience a sufficiently long sequence of mostly positive realizations that would permit each individual in the group to have more than one surviving offspring, and the asymptotic growth of their dynasty would be positive. Hence, the surviving dynasties among these initial group of relatively loss-neutral individuals will increase in size over time, and in light of lower (i.e., zero) growth rate of the loss-averse group, will dominate the population in the long-run. Nevertheless, if these individuals would experience highly correlated shocks, the likelihood of a sufficiently long sequence of realization is negligible and the dynasties of those relatively loss-neutral individuals would drop from the evolutionary cliff and would become extinct in the long-run.

Thus, as long as the climatic shocks are predominantly idiosyncratic, while the prudent strategy of the safe mode of production would assure the survival of the dynasty and may appear optimal from an individual viewpoint, nature will ultimately select the relatively loss-neutral individuals. A significant fraction of the loss-neutral individuals would become extinct in the short run, but the surviving fraction would experience higher reproductive success and would dominate the population in the long-run.

3 Empirical Strategy and Data

This section presents the empirical strategy developed to analyze the effect of the idiosyncratic and aggregate components of temperature shocks on contemporary variations in the rate of loss aversion. Moreover, it describes the global measures of temperature intertemporal volatility and spatial correlation that are designed to capture the idiosyncratic and aggregate components of temperature shocks, as well as a range of proxies and measures of loss aversion at the individual, country and ethnic group level.

3.1 Identification Strategy

The empirical analysis surmounts significant hurdles in the identification of the causal effect of climatic conditions on the evolution of loss aversion. In particular, the research adopts an empirical strategy that is designed to mitigate concerns about the potential role of reverse causality, sorting, and omitted variables, in the observed association between climatic characteristics and loss aversion.

First, since unlike soil characteristics, climatic characteristics are largely orthogonal to individuals' preferences and thus choices, the focus on climatic (rather than soil) characteristics assures that the association between climatic characteristics and loss aversion is not driven by reversed causality. In particular, historical climatic patterns, for the most part, are determined by the regional geographical conditions and are orthogonal to human interventions.

Second, potential concerns about the role of omitted geographical, institutional, cultural, and human characteristics in the observed association between climatic volatility and spatial correlation and loss aversion are mitigated by accounting for a large set of confounding characteristics that might have determined loss aversion and are correlated with climatic volatility and spatial correlation. In particular the analysis accounts for: potentially confounding effects of geographical characteristics (e.g., absolute latitude, mean elevation, suitability of land for agriculture, distance to coast or navigable river, percentage of land in the tropical, subtropical and temperate zones, level of precipitation, and landlocked societies), as well as the time elapsed since the neolithic revolution; (ii) regional fixed effects, capturing unobserved time-invariant heterogeneity at the regional level; (iii) host country fixed effects, and thus time-invariant country-of-birth specific factors, (e.g., geography, institutions, history, and culture) for second-generation migrants; (iv) individual characteristics (e.g., age, gender, number of siblings, religion, education, and income); (v) ethnographic characteristics (e.g., intensity of agriculture and animal husbandry, settlement structure, and plow use).

Third, the adoption of the epidemiological approach and the exploration of the determinants of loss aversion among second-generation migrants permits the analysis to overcome two major concerns: (i) it distinguishes between the effect of temperature volatility and spatial correlation in the parental country of origin (rather than those in country of residence) on loss aversion, capturing the culturally-embodied, intergenerationally-transmitted component of the effect of geography, rather than the direct effect of geography; (ii) it accounts for time invariant unobserved heterogeneity in the host country (e.g., geographical, cultural and institutional characteristics), and thus mitigates possible concerns about the confounding effect of host-country-specific characteristics.

Fourth, to alleviate concerns that sorting of loss averse individuals into the less volatile environments governs the observed association between volatility and loss aversion, the study exploits the "random assignment" of volatility in the course of the Columbian Exchange to identify the impact of climatic volatility on the evolution of loss aversion. This quasi natural experiment further mitigates concerns about the confounding effects of unobservable geographical factors in the parental country of origin, while demonstrating the importance of evolutionary processes in the pre-1500 as well as in the post-1500 period in the formation of loss aversion.

Finally, the analysis presented in Appendix F explores the impact of climatic volatility on the rate of loss aversion, and observed behavior, across ethnic groups in the precolonial era, linking climatic characteristics to observed behavior in the past.

3.2 Dependent Variable: Proxies for Loss Aversion

Adequately capturing variation in the rate of loss aversion poses a significant challenge due to the scarcity of these proxies. To overcome this difficulty novel measures of loss aversion for individual and are validated using an experimental data.

Variations in the prevalence and the distribution of loss-aversion across individuals is captured by a variety of newly introduced measures of the intensity of loss aversion. Exploiting the ESS, GSS and the WVS, the degree of loss aversion is captured by individual's ranking of potential job characteristics. In particular, preference for job security over other characteristics such as salary and promotion opportunities are used as a proxy for loss-aversion. Importantly, since conceivably a layoff is typically only a transitory phenomenon, preferences for job security over higher salary does not simply represents the trade-off between potential gains and loss of income, and thus risk aversion, but rather the reluctance of individuals to lose something that is in their possession, and thus loss aversion. Alternatively, if one views a job as a 'gamble' with 'being employed' as a reference point, the state 'being fired' would then represent a down-side of this gamble. From this point of view, preference for job security over other characteristics or over salary would capture individual's rate of loss aversion, as it represents one's reluctance towards getting the down-side or 'loosing' the gamble.

The global distribution of the proxy for loss aversion based on the WVS is depicted in Figure B.1, reflecting a lower degree of loss aversion in most countries in the upper part of Northern hemisphere as well as among the descendants of these regions in the US, Canada, Australia and New Zealand. In contrast, higher degree of loss aversion can be detected in Southern Europe and the descendants of these regions in Latin America, as well as in Africa and South Asia.

The preference for job security as a proxy measure for loss aversion is validated using an experimental data derived by Wang et al. (2017). In particular, the study provides the individual level estimates of loss aversion and risk aversion, based on the respondents' evaluation of simple lotteries, as well as those individuals' assessment of different job characteristics, including job security. This allows to perform a validation analysis by establishing a correspondence between the experimental measure of loss aversion and the respondents' valuation of job security.

The country level distribution of loss aversion is based on an experimental evidence from 2939 subjects across 30 countries, in which participants evaluate a number of prospects over gains and losses (l'Haridon and Vieider, 2019).

3.3 Independent Variable: Idiosyncratic and Aggregate Climatic Uncertainty

This section describes the measures that will be used to capture the impact of the idiosyncratic and aggregate components of climatic shocks on loss aversion. In light of the predictions of the theory, the prevalence of loss aversion is linked to intertemporal climatic volatility as well as spatial correlation in climatic conditions. A-priori one could have captured these climatic characteristics using either temperature or precipitation. However, as suggested by Table B.1, while productivity in the Malthusian era is significantly correlated with various characteristics of temperature, it is orthogonal to the corresponding measures of precipitation. Thus the proposed hypothesis is examined based on the impact of measures of intertemporal temperature volatility, as well as spatial correlation in temperature on the intensity of loss aversion.

As noted in the empirical strategy section, measures of intertemporal temperature volatility and temperature spatial correlation capture the distinction between the aggregate and the idiosyncratic nature of the shocks. Indeed, stronger temperature spatial correlation reflects a higher likelihood that neighboring regions would obtain similar realizations of temperature shock, capturing the aggregate nature of the shocks. Similarly, keeping the temperature spatial correlation constant, the level of temperature volatility corresponds to the variability of temperature shocks at a local level, capturing the idiosyncratic component of the shock.

Hence, following the method used by Durante (2009), these measures are constructed based on the monthly temperatures over the period 1900-2000, using the $0.5° \times 0.5°$ resolution of the Climatic Research Unit (CRU).[22,23] In particular, intertemporal temperature volatility over the period 1900-2000 is the average volatility in each month over this 100 year period, where the monthly volatility captures the variance in monthly temperature over this 100 year period. Similarly, temperature spatial correlation is the correlation between the sequences of 1200 monthly temperature in a given cell over the years 1900-2000, and the average of those sequences in its eight neighboring cells. Each of these measures is first calculated at the grid cell level and then aggregated at the country and ethnic group levels.

The global distribution of these two climatic measures is depicted in Figures B.2 and B.3. The figure suggests that higher intertemporal temperature volatility is observed in the upper part of the Northern hemisphere and a lower one closer to the equator. Indeed, in line with the proposed theory of a negative effect of climatic volatility on loss aversion, accounting for the post-1500 migration to the new world as well as to Australia and New Zealand, individuals originated from the most volatile regions of the world tend to be less loss averse (as depicted in Figure B.1). Furthermore, consistent with the proposed theory of a positive effect of temperature spatial correlation on loss aversion, indeed higher intertemporal temperature volatility tends to be lower in the upper part of the northern hemisphere where loss aversion is lower, and lower in proximity to the equator where loss aversion is higher.

An alternative measure of temperature intertemporal volatility is employed in the analysis to capture the effect

[22] Potential concerns about changes in climate over the course of human history that is relevant for the evolution of loss aversion, appears largely misplaced. As reported in Figures C.1 and C.2, climatic volatility and spatial correlation over the past 100 year period are highly correlated with the corresponding climatic characteristics in the past 1500 years.

[23] While the computational methodology is identical to the one used by Durante (2009), the data differs, given the global focus.

of historical climatic shocks on the evolution of loss aversion. The measure of historical temperature volatility is calculated using the paleoclimatic data reconstructed in Mann et al. (2009) on a $5° \times 5°$ resolution for a 1500-year period spanning from 500 to 2000. The measure is constructed as volatility of annual temperature anomalies for each grid cell over the whole available period, as well as for historical subsample of years between 500 and 1000. The measure is aggregated from a grid-level to a level of country.

To exploit the implications of the natural experiment associated with the Columbian Exchange for the evolution of loss aversion a novel measure of an effective potential volatility is introduced. In particular, for each type of crop, effective temperature volatility is calculated as an average of monthly volatilities across four month prior to the beginning of crop-specific growth cycle – volatility during the period when food scarcity is at its peak and climatic shocks may be particularly detrimental to the effectiveness of storage of crops, productivity of the upcoming harvest and the hunting and gathering of supplementary food sources. The qualitative results remain unaffected under the alternative specification of the time window within a year in which individual are the most venerable to the detrimental effect of climatic shocks, including time intervals that reflect an overlap between the growing and non-growing season. In addition, for each of the $0.5° \times 0.5°$ grid cells corresponding to CRU dataset the potential yield maximizing crop is identified for a period prior to 1500 (e.g., crops native to the region) and for the period following the Columbian Exchange (e.g., any crop of the world) in a manner similar to Galor and Özak (2016). Effective potential volatility prior and after the Columbian Exchange is then identified as an effective crop-specific volatility for these crops. Hence, the change in the degree of effective potential volatility due to the Columbian Exchange would be observed in a case when a potentially superior crop was introduced to a particular grid cell and a growth cycle of the new crop was different from the one corresponding to a previously yield-maximizing crop. The variation in the change of effective potential volatility is ultimately used to identify the effect of a "random assignment" of effective potential volatility on the evolution of loss aversion.

As elaborated above, an alternative climatic dimension that could have been used to capture the idiosyncratic and the aggregate components of climatic shocks is precipitation. However, shocks to precipitation, unlike shocks to temperature appear orthogonal to productivity in the pre-industrial era and are therefore tangential to the evolution of loss aversion. In particular, as demonstrated in Table B.1, a cross-country analysis suggests that neither the mean level of precipitation nor precipitation volatility have a statistically significant association with population density and urbanization level in the year 1500, and thus in light of the Malthusian paradigm (Ashraf and Galor, 2011), have no significant association with the level of technology and productivity in the year 1500. In contrast, the level of temperature volatility has a strong statistically and economically significant effect on both measures. Moreover, the qualitative results remain intact, if one accounts for the confounding effects of additional geographical characteristics (e.g., absolute latitude, mean elevation, percentage of arable land, mean land suitability, island and landlocked dummy, and distance to coast or river), the timing of the neolithic revolution, and regional fixed effects. These results may reflect the view that while the adverse effect of precipitation shocks can be potentially mitigated by irrigation and drainage systems, the adverse effects of temperature shock are harder to be mitigated by human intervention.

4 Empirical Analysis: Second Generation Migrants

This section analyzes the effect of intertemporal temperature volatility and temperature spatial correlation on the second-generation migrants' preferences of job security versus salary and other characteristics in Europe and the United States. In particular, it analyzes the effect of temperature volatility and correlation on preferences of jobs security versus salary as reported in the European Social Survey (ESS), and on preferences of jobs security versus salary and other characteristics (short working hours, promotion opportunities and job satisfaction) as reported in the General Social Survey (GSS). The analysis of second-generation migrants accounts for time invariant unobserved heterogeneity in the host country (e.g., geographical and institutional characteristics). Moreover, since temperature volatility and spatial correlation in the parental country of origin are distinct from those of the country of residence, the estimated effect of temperature volatility and correlation in the country of origin captures the culturally-embodied, intergenerationally-transmitted effect, rather than the direct effect of geography. The effect of temperature volatility and correlation on preferences of job security versus salary or other characteristics is estimated via ordinary least squares (OLS) according to the following specification

$$job_{ict}^{sec} = \beta_0 + \beta_1^{vol} temp_{ip}^{vol} + \beta_1^{corr} temp_{ip}^{corr} + \sum_j \gamma_{0j} X_{ipj} + \gamma_1 yst_{ip} + \sum_j \gamma_{2j} Z_{ij} + \sum_c \gamma_c \delta_{ic} + \sum_t \gamma_t \delta'_{it} + \epsilon_i \quad (41)$$

where job_{ict}^{sec} captures valuation of job security over salary or other characteristics of second-generation migrant i in country c measured in round/wave t, $temp_{ip}^{vol}$ and $temp_{ip}^{corr}$ are measured in the country of origin of parent p of individual i, X_{ipj} is geographical characteristic j of the country of origin of parent p of individual i, yst_{ip} are the years since the country of origin of parent p of individual i transitioned to agriculture, Z_{ij} is characteristic j of individual i (age, gender, number of siblings, religion, education level, income), δ_{ic} is the country of birth fixed effect of individual i, δ'_{it} is the round/wave fixed effect of individual i, and ϵ_i is the error term. The theory predicts negative effect of temperature volatility and positive effect of temperature spatial correlation (i.e., $\beta_1^{vol} < 0$ and $\beta_1^{corr} > 0$).

4.1 Determinants of Loss Aversion among Second Generation Migrants in Europe

This subsection analyzes the effect of intertemporal temperature volatility and temperature spatial correlation on the second-generation migrants' preferences of job security versus salary in Europe, in light of the conjectured positive association between loss aversion and preference for job security over salary. The effect of temperature volatility and correlation on preferences of job security versus salary is estimated via ordinary least squares (OLS) using the empirical model (41).

Table 1 demonstrates the negative statistically and economically significant effect of temperature volatility and positive significant effect of temperature spatial correlation on preferences of job security versus salary as suggested by the theory. The estimated effect implies that increasing temperature volatility in the parental country of origin by one standard deviation decreases the difference between second-generation migrant's valuation of job security and salary between 0.16 and 0.24 units[24], while increasing temperature spatial correlation in the parental country of origin by one standard deviation increases the difference between second-generation migrant's valuation of job security and salary between 0.034 and 0.059 units.

The relationship between intertemporal temperature volatility and temperature spatial correlation and preferences of job security versus salary, accounting for country of birth fixed effects, and therefore for unobserved time-invariant omitted variables at the country of birth level, are demonstrated in column (1). The estimated effect of temperature volatility is negative and statistically significant at the 1% level, while estimated effect of temperature spatial correlation is positive and statistically significant at the 10% level, implying economically significant effects suggested by the theory.

Table 1: Determinants of Loss Aversion: Second Generation Migrants in Europe (OLS)

	Preferred Job Characteristic: Security vs. Salary					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.157***	-0.223***	-0.228***	-0.235***	-0.241***	-0.229***
	(0.045)	(0.046)	(0.062)	(0.062)	(0.062)	(0.061)
Temperature (Spatial Correlation)	0.034*	0.052**	0.059***	0.056***	0.057***	0.056***
	(0.020)	(0.021)	(0.022)	(0.021)	(0.021)	(0.021)
Temperature (Mean)	-0.138***	-0.095*	-0.099	-0.135	-0.140	-0.088
	(0.043)	(0.050)	(0.092)	(0.093)	(0.091)	(0.092)
Absolute Latitude		0.093***	0.136**	0.109*	0.113*	0.152**
		(0.032)	(0.059)	(0.061)	(0.062)	(0.062)
Elevation (Mean)		-0.003	0.009	-0.000	0.001	0.009
		(0.017)	(0.022)	(0.024)	(0.024)	(0.024)
Land Suitability (Mean)			0.030	0.018	0.016	0.014
			(0.044)	(0.048)	(0.048)	(0.048)
Neolithic Transition Timing				0.019	0.020	0.011
				(0.016)	(0.016)	(0.016)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes
Round FE	No	No	No	No	Yes	Yes
Individual Controls	No	No	No	No	No	Yes
Adjusted-R^2	0.05	0.06	0.06	0.06	0.06	0.07
Observations	3907	3907	3907	3907	3907	3907

Notes: Using OLS regressions, this table suggests that the preferred job characteristics of second generation migrants reflect loss aversion. In particular, their valuation of job security vs. salary is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are gini index of land suitability , distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

Column (2) accounts for some of the other confounding geographical characteristics of the country of origins.

[24]Each characteristic is evaluated by the scale from 1 to 5, so that their difference takes values from -4 to 4.

In particular, absolute latitude and mean elevation. Accounting for the effects of geography and country of birth heterogeneity strengthens estimated effects of temperature volatility and spatial correlation on preferences of job security versus salary both in terms of absolute values and significances. In particular, estimated effect of temperature spatial correlation becomes statistically significant at the 5% level. Column (3) accounts for the whole set of confounding geographical characteristics of the country of origins, which, apart from absolute latitude and mean elevation, includes mean level and the gini index of land suitability, distance to coast or navigable river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Reassuringly, the coefficient on temperature volatility remains statistically significant at the 1% level, while coefficient on temperature spatial correlation becomes statistically significant at the 1% level as well. The effects of other confounding geographical characteristics are less significant than the effects of temperature volatility and correlation. In particular, most geographical characteristics have no significant effect on preferences of job security versus salary.

Column (4) considers the confounding effect of the advent of sedentary agriculture, as captured by the years elapsed since the onset of the Neolithic Revolution, on the evolution of the loss aversion. The effects of temperature volatility and spatial correlation remain statistically significant at the 1% level. Additionally, the effect of the timing of transition to the Neolithic has no significant effect on preferences of job security versus salary.

Columns (5) and (6) sequentially account for the survey round fixed effects and second-generation migrant's individual characteristics (i.e., age, gender, number of siblings, religion, education level, and income). The estimated effects of temperature volatility and spatial correlation on preferences of job security versus salary continue to be statistically significant at the 1% level. It should be noted that the coefficients on temperature volatility and spatial correlation are remarkably stable in terms of absolute values across all specifications, especially in columns (2) – (6).

4.1.1 Loss Aversion vs. Risk Aversion

This subsection demonstrates that intertemporal temperature volatility and temperature spatial correlation are not associated with the attitude toward risk aversion. Furthermore, while risk seeking, as one would expect is associated with a reduced preference for job security, accounting for risk aversion has no impact on the effect of climate on loss aversion. Hence, the observed effects of climatic characteristics on loss aversion operate directly, rather than through their influence on risk aversion.

As suggested by columns (1) – (6) of Table 2, individuals' preference for adventure and risk seeking are not significantly associated with intertemporal temperature volatility and temperature spatial correlation.[25] Moreover, as demonstrated in columns (7) and (8), the effect of intertemporal temperature volatility and temperature spatial

[25] Individuals attitude towards risk is captured by the response to the question: "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. She/he looks for adventures and likes to take risks. She/he wants to have an exciting life."

Table 2: Determinants of Risk Aversion: Second Generation Migrants in Europe

	Preference For							
	Risk Seeking						Job Security	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperature (Volatility)	-0.022	-0.084	-0.016	-0.023	-0.011	-0.031	-0.222***	-0.220***
	(0.103)	(0.131)	(0.122)	(0.120)	(0.119)	(0.088)	(0.066)	(0.066)
Temperature (Spatial Correlation)	-0.027	-0.011	0.001	-0.003	-0.005	-0.021	0.060***	0.060***
	(0.042)	(0.047)	(0.045)	(0.046)	(0.046)	(0.033)	(0.021)	(0.021)
Risk Seeking								-0.051***
								(0.010)
Temperature (Mean)	-0.227**	-0.139	-0.075	-0.116	-0.102	0.135	-0.073	-0.082
	(0.091)	(0.108)	(0.147)	(0.165)	(0.163)	(0.131)	(0.098)	(0.098)
Absolute Latitude		0.136**	0.046	0.015	0.009	0.170*	0.150**	0.139**
		(0.067)	(0.120)	(0.133)	(0.130)	(0.091)	(0.064)	(0.065)
Elevation (Mean)		0.012	0.050	0.039	0.037	0.082**	0.012	0.009
		(0.043)	(0.048)	(0.048)	(0.048)	(0.036)	(0.024)	(0.024)
Land Suitability (Mean)			-0.022	-0.036	-0.033	-0.034	0.018	0.020
			(0.066)	(0.070)	(0.071)	(0.052)	(0.047)	(0.048)
Neolithic Transition Timing				0.024	0.022	-0.033	0.009	0.011
				(0.038)	(0.038)	(0.028)	(0.017)	(0.017)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	No	No	No	No	Yes	Yes	Yes	Yes
Individual Controls	No	No	No	No	No	Yes	Yes	Yes
Adjusted-R^2	0.03	0.04	0.04	0.04	0.04	0.15	0.06	0.07
Observations	5699	5699	5699	5699	5699	5699	3784	3784

Notes: Using OLS regressions, columns (1) through (6) of the table suggests that second generation migrants' valuation of Adventure and Risk Seeking is neither affected by temperature volatility (idiosyncratic risk), nor by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Columns (7) and (8) suggest that second generation migrants' valuation of job security vs. salary is negatively affected by the degree of risk seeking and is still negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin.. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

correlation on the preference of second generation migrants in Europe for job security over salary, as estimated in Table 1, is unaffected by the highly significant positive association between the rates of risk aversion and the rate of loss aversion, lending credence to the hypothesis that geographical origins of loss aversion are distinct from those of risk aversion.

4.2 Determinants of Loss Aversion among Second Generation Migrants in the US

This subsection examines the effect of intertemporal temperature volatility and temperature spatial correlation on the second-generation migrants' preferences of job security versus salary and other job characteristics in the US, in light of the conjectured positive association between loss aversion and preference for job security over salary and other characteristics (short working hours, promotion opportunities and job satisfaction). The effect of temperature volatility and correlation on preferences of job security versus salary and other job characteristics is estimated via ordinary least squares (OLS) using the model analogous to model (41).

Table 3: Determinants of Loss Aversion: Second Generation Migrants in the US (OLS)

	Preferred Job Characteristic						
	Security vs Others					Security vs Salary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Temperature (Volatility)	– 0.184*	– 0.219**	– 0.357***	– 0.328***	– 0.453***	– 0.424***	– 0.515***
	(0.094)	(0.083)	(0.073)	(0.074)	(0.072)	(0.132)	(0.161)
Temperature (Spatial Correlation)	0.125**	0.151***	0.176***	0.195***	0.197***	0.241***	0.238***
	(0.048)	(0.051)	(0.053)	(0.065)	(0.046)	(0.084)	(0.066)
Temperature (Mean)	-0.054	-0.045	-0.097	-0.006	-0.070	-0.099	-0.322
	(0.079)	(0.142)	(0.096)	(0.103)	(0.125)	(0.182)	(0.211)
Absolute Latitude		0.018	0.052	0.108	0.186	0.333	0.092
		(0.123)	(0.156)	(0.159)	(0.197)	(0.273)	(0.366)
Elevation (Mean)		-0.045	-0.139	-0.052	-0.160*	-0.162	-0.295*
		(0.062)	(0.091)	(0.103)	(0.085)	(0.197)	(0.168)
Land Suitability (Mean)			-0.125	-0.072	-0.164**	-0.120	-0.197
			(0.092)	(0.095)	(0.078)	(0.162)	(0.158)
Neolithic Transition Timing				-0.103	-0.070	-0.082	-0.044
				(0.065)	(0.065)	(0.101)	(0.091)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes
Wave FE	No	No	No	No	Yes	No	Yes
Individual Controls	No	No	No	No	Yes	No	Yes
Adjusted-R^2	0.02	0.02	0.01	0.01	0.08	0.04	0.07
Observations	1328	1328	1328	1328	1171	1171	1171

Notes: Using OLS regression, this table suggests that the preferred job characteristics of second generation migrants reflect loss aversion. In particular, their valuation of job security vs other characteristics (salary, short working hours, promotion opportunities and job satisfaction) and of job security vs. salary is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability , distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

Table 3 demonstrates a negative statistically and economically significant effect of temperature volatility and positive significant effect of temperature spatial correlation on second-generation migrants' preferences of job security versus salary and other characteristics. In particular, Columns (1) through (5) demonstrate the effect of temperature volatility and spatial correlation on preferences for job security over all other characteristics[26], sequentially accounting for the confounding effects of unobserved time-invariant omitted variables at the region of birth level, other geographical characteristics (mean temperature, absolute latitude, mean elevation, mean level and the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level), the advent of sedentary agriculture, as captured by the years elapsed since the onset of the Neolithic Revolution, survey wave fixed effects and individual characteristics of a second generation migrant (age, gender, number of siblings, religion, education level, and income). The estimated

[26]The preferences for job security versus other characteristics are measured as the rank assigned to the job security by the second-generation migrant based on the answers to the questions "...which one thing on this list (security, salary, short working hours, promotion opportunities and job satisfaction) you would most/second most/... prefer in a job?"

effects imply that increasing temperature volatility in the parental country of origin by one standard deviation decreases the probability of job security having a higher ranking between 18 and 42 percentage points, while increasing temperature spatial correlation by one standard deviation increases the probability of job security having a higher ranking between 13 and 17 percentage points. It should be noted that coefficients on the temperature volatility and spatial correlation are rather stable across specifications and statistically significant at the 1% level in two final specifications.

Columns (6) and (7) replicate columns (4) and (5) with preference for job security over salary[27] being the explained variable. Estimated effects of temperature volatility and spatial correlation are statistically significant at the 1% level and imply that increasing intertemporal temperature volatility in the parental country of origin by one standard deviation decreases the difference in ranks of job security and salary between 0.52 and 0.62 units, while increasing temperature spatial correlation by one standard deviation increases the difference in ranks of job security and salary between 0.24 and 0.28 units. Reassuringly, confounding geographical characteristics of parental country of origin are less significant than the effects of temperature volatility and spatial correlation across all specifications and explained variables. In particular, most geographical characteristics have no significant effect on preferences of job security versus salary.

4.3 Robustness to Historical Temperature Volatility over the Period 500-20000

This subsection examines the effect of the historical temperature volatility on the level of loss aversion of second-generation migrants in the US, as captured by their preference for job security.[28] As shown in Table 4, second generation migrant's valuation of job security, is still positively associated with temperature spatial correlation and negatively with inter-temporal temperature volatility calculated for longer time horizon. In particular, columns (1) through (3) document that the degree of loss aversion of second generation migrants is negatively affected by the intertemporal temperature volatility between the years 500 CE and 2000 CE. In addition, columns (4) through (6) imply negative and significant association between second-generation migrant's preference for job security and measure of idiosyncratic climatic volatility, which captures variation in temperature in the past, between the years 500 CE and 1000 CE.

[27]Preferences of job security versus salary are measured as the difference between the rankings of the two characteristics, ranging from -4 to 4.

[28]As reported in Appendix D.1.6, the results is robust for the use of second generation migrants in Europe.

Table 4: Determinants of Loss Aversion: Historical Volatility

	Preference for Job Security					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility) 500-2000	-0.277***	-0.298***	-0.297***			
	(0.062)	(0.060)	(0.056)			
Temperature (Volatility) 500-1000				-0.269***	-0.291***	-0.291***
				(0.076)	(0.073)	(0.077)
Temperature (Spatial Correlation)	0.110***	0.110***	0.098***	0.134***	0.133***	0.121***
	(0.039)	(0.035)	(0.035)	(0.048)	(0.032)	(0.029)
Temperature (Mean)	-0.116	-0.135	-0.131	0.010	-0.013	-0.010
	(0.194)	(0.233)	(0.233)	(0.218)	(0.253)	(0.253)
Absolute Latitude	-0.048	-0.123	-0.034	0.081	-0.016	0.075
	(0.216)	(0.217)	(0.220)	(0.253)	(0.257)	(0.255)
Elevation (Mean)	0.045	0.024	0.046	0.082	0.061	0.082
	(0.099)	(0.110)	(0.115)	(0.100)	(0.111)	(0.116)
Land Suitability (Mean)	-0.121	-0.149*	-0.146*	-0.208*	-0.254**	-0.252**
	(0.092)	(0.077)	(0.086)	(0.114)	(0.099)	(0.108)
Neolithic Transition Timing	-0.070	-0.086	-0.087	-0.109*	-0.128**	-0.127*
	(0.071)	(0.072)	(0.074)	(0.059)	(0.060)	(0.062)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	No	Yes	Yes	No	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Adjusted-R^2	0.05	0.08	0.09	0.05	0.08	0.09
Observations	1166	1166	1166	1166	1166	1166

Notes: Using OLS regressions, this table suggests that second generation migrants' valuation of job security vs. salary negatively affected by historical temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

4.4 Validation of the Proxy for Loss Aversion

This subsection suggests that the preference for job security is a valid proxy measure for loss aversion. Using Wang et al. (2017) experimental estimates of both the degree of loss aversion as well as risk aversion, for 6291 individuals across the globe, based on their evaluation of various lotteries, as well as these individuals' preferences for job security and other job characteristics, the use of preference of job security as a proxy for loss aversion is validated.

As reported in Table 5, there exists a positive and highly significant association between individual's evaluation of job security and the average estimate of loss aversion derived from the experiments. The relationship remains significant with each of the two separate estimates of loss aversion, used in the construction of the average level of loss aversion. Moreover, this highly significant association is robust to the introduction of country and the lab fixed effects, as well as individual controls (e.g., age, gender, college major). Furthermore, accounting for measures of risk aversion derived in the same experiment, no significant relation between risk aversion and preference for job security is found, while the association with loss aversion remains stable and highly significant. In addition, placebo test reported in Table D.5, indicate that preference for alternative job characteristics are not associated with the provided measure of loss aversion.

Table 5: Validation of Preference for Job Security as a Proxy Measure of Loss Aversion

	Preference for Job Security						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Loss Aversion	0.12***	0.12***	0.12***	0.12***	0.12***		
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)		
Loss Aversion (Estimate 1)						0.13***	
						(0.04)	
Loss Aversion (Estimate 2)							0.07**
							(0.03)
Risk Aversion		0.01	0.01	0.01	0.01	0.01	0.01
		(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Country FE	No	No	Yes	Yes	Yes	Yes	Yes
Lecture FE	No	No	No	Yes	Yes	Yes	Yes
Individual Controls	No	No	No	No	Yes	Yes	Yes
Adjusted-R^2	0.00	0.00	0.10	0.10	0.11	0.11	0.11
Observations	6291	6291	6291	6291	6291	6291	6310

Notes: This table suggests that individual preference for job security is positively associated with individual level of loss aversion as measured by Wang et al. (2017). Individual controls include age, gender, college major and native born dummy variable. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the country-lecture level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

4.5 The Robustness of the Analysis

The results are robust to an extensive number of checks. In particular, the effects are present when an alternative estimation method of Ordered Probit is used (Tables D.1). In addition, employing the methodology of Altonji et al. (2005) and Oster (2014), Table D.3 demonstrates that it is highly unlikely that omitted variables could have affected the qualitative results presented in Tables 1 and 3. Moreover, placebo tests documented in Table D.4 illustrate that alternative job characteristics that are unrelated to loss aversion are not affected by the volatility and spatial correlation in temperature. Other cultural dimensions (e.g., obedience, altruism, preference for equality and strong government) are also orthogonal to the climatic volatility and spatial correlation as documented in Tables D.6, D.8, and D.7. The results are also robust to accounting for: the density of weather stations from which the climatic data was collected (Table D.11), the measures of preindustrial development as captured by the population density and GDP per-capita (Table D.10), and the role of potential outliers (Table D.12). Finally, when estimated univariety and without additional controls (Table D.13) the results are consistent with the predictions of the theory as summarized in the Section 2.7. Furthermore, volatility and spatial correlation in precipitation are not correlated with loss aversion (Table B.2).

4.6 Natural Experiment: The Columbian Exchange

This section exploits the “random assignment” of volatility in the course of the Columbian Exchange to identify the impact of climatic volatility on the evolution of loss aversion, addressing potential concerns that sorting of loss averse individuals into the less volatile environments governs the observed association between volatility and loss aversion. The findings suggest that sorting played an insignificant role in the determination of loss aversion in the post-1500 period.

The potential adoption of dominating crops in the course of the Columbian Exchange, had changed the effective volatility since different crops have different growth cycles.[29] Hence, this quasi natural experiment generated exogenous variation in the change of effective crop-specific temperature volatility in each region, permitting the identification of the impact of volatility on loss aversion. The identifying assumption is that, conditional on the pre-1500 distribution of effective potential volatility, the change in effective potential volatility resulting from the introduction of new crops is distributed randomly, independently of any other attributes of the grid.

Table 6: Determinants of Loss Aversion: Random Assignment of Volatility

	ESS			GSS					
	Security v Salary			Job Security			Security v Salary		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Temperature (Volatility)	-0.250***			-0.450***			-0.587***		
	(0.060)			(0.059)			(0.121)		
Effective Temperature (Volatility) pre 1500		-0.102***	-0.084***		-0.321***	-0.250***		-0.462***	-0.362***
		(0.036)	(0.032)		(0.063)	(0.046)		(0.157)	(0.115)
Effective Temperature (Volatility) change		-0.125***	-0.113**		-0.142***	-0.132***		-0.158**	-0.142**
		(0.045)	(0.044)		(0.033)	(0.032)		(0.059)	(0.053)
Temperature (Spatial Correlation)	0.098***	0.100***		0.200***	0.139***		0.257***	0.194**	
	(0.029)	(0.031)		(0.047)	(0.042)		(0.068)	(0.086)	
Effective Temperature (Correlation) pre 1500			0.108***			0.143***			0.200***
			(0.040)			(0.035)			(0.065)
Effective Temperature (Correlation) change			-0.006			-0.011			-0.066
			(0.015)			(0.030)			(0.076)
Temperature (Mean)	-0.167*	-0.075	-0.111	-0.132	0.098	0.055	-0.306	0.079	0.039
	(0.091)	(0.088)	(0.089)	(0.080)	(0.117)	(0.099)	(0.180)	(0.231)	(0.192)
Country/Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Round/Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.06	0.06	0.06	0.09	0.09	0.09	0.08	0.07	0.08
Observations	3859	3859	3859	1172	1172	1172	1172	1172	1172

Notes: Using OLS regressions, this table suggests that second generation migrants' valuation of job security vs. other characteristics and job security vs. salary positively affected by temperature spatial correlation (aggregate uncertainty), negatively affected by temperature volatility (idiosyncratic risk), effective temperature volatility and its change due to the Columbian exchange in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

As presented in Columns (2), (5) and (8) of Table 6, the degree of loss aversion of second generation migrants in Europe and the US, as captured by their preference for job security, is negatively and significantly affected by potential temperature volatility prior to the year 1500, as well as its change due to the Columbian Exchange. Reas-

[29]The methodology is further elaborated in Appendix E

suringly the positive effect of temperature spatial correlation on the preference for job security remains qualitatively and quantitatively unaltered, compared to the corresponding baseline specification captured in the columns (1), (4) and (7). This finding identifies the effect of a "random assignment" of effective potential volatility on the evolution of loss aversion and suggests that sorting played an insignificant role in the determination of loss aversion.

The qualitative results remain unaffected under the alternative specification of the time window within a year in which individual are the most venerable to the detrimental effect of climatic shocks. In particular, Table E.2 demonstrates that the effect is present if climatic volatility captures temperature variation in the prior and in the beginning of the growth cycle.

The concern over the sorting of loss averse individuals into locations with high spatial correlation of climatic shocks is significantly less intense. For instance, as opposed to volatility, correlation of temperature across space is not transparent to a casual observer. In addition, *ceteris paribus*, individual's wellbeing is unaffected by the correlation of climatic shocks across different locations. Nevertheless, similar empirical exercise can be performed with respect to the effective spatial correlation of temperature and its change in the course of the Columbian Exchange. As documented, in columns (3), (6) and (9) of Table 6, preference for loss aversion of second generation migrants is indeed positively and significantly affected by the effective temperature spatial correlation prior to the year 1500, which goes in line with the previous results and theoretical predictions. The change in the level of the effective temperature spatial correlation, however, has no statistically significant impact on the preference for loss aversion. Such result could be a consequence of the lack of variation in the magnitudes of effective temperature spatial correlation changes across locations.

5 Global Analysis

5.1 Cross Country Analysis

This subsection explores the validity of the theory utilizing cross-county experimental estimates of loss aversion. Consistent with the predictions of the theory, it finds a negative effect of temperature volatility and a positive effect of spatial correlation in temperature on country-level experimental estimates of loss aversion. The analysis is conducted using the experimental estimates of loss aversion, provided by l'Haridon and Vieider (2019), based on the responses of 2939 subjects across 30 countries, who evaluated a number of prospects over gains and losses.

The effects of temperature volatility and spatial correlation on the country level measure of loss aversion are estimated using the linear model with the following specification:

$$LA_c = \beta_0 + \beta_1^{vol} temp_c^{vol} + \beta_1^{corr} temp_c^{corr} + \sum_j \gamma_{0j} X_{cj} + \gamma_1 yst_c + \sum_w \gamma_w \delta_{cw} + \epsilon_c \tag{42}$$

where $LA_c > 0$ is the estimate of loss aversion across the experiment participants in country c, $temp_c^{vol}$ and $temp_c^{corr}$

are temperature volatility and spatial correlation measured in the country c, X_{cj} is geographical characteristic j (absolute latitude, mean elevation, mean temperature, mean level and the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level) of country c, yst_c are the years since the country c transitioned to agriculture, δ_{cw} is a complete set of regional fixed effects and ϵ_c is the error term. The theory predicts a negative effect of temperature volatility and a positive effect of temperature spatial correlation (i.e., $\beta_1^{vol} < 0$ and $\beta_1^{corr} > 0$).

Table 7 documents that in accordance with the predictions of the theory, and despite a small sample, there exists a negative and significant effect of temperature volatility as well as a positive and significant effect of temperature spatial correlation on the intensity of loss aversion at the country level. The effect is robust to accounting for the potentially confounding effects of other geographic characteristics (column 2), world bank regional fixed effects (column 3), the number of years since the Neolithic revolution (column 4). Furthermore, the effect is also present if either of the effects are estimated independently (columns 5 and 6).

Table 7: Determinants of Loss Aversion: Country Level

	Loss Aversion					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.59**	-1.55***	-1.51**	-1.51**	-1.52**	
	(0.23)	(0.49)	(0.60)	(0.63)	(0.63)	
Temperature (Spatial Correlation)	0.85**	1.43***	1.36**	1.42**		1.43*
	(0.40)	(0.47)	(0.57)	(0.58)		(0.70)
Additional Geographic Controls	No	Yes	Yes	Yes	Yes	Yes
Continent FE	No	No	Yes	Yes	Yes	Yes
YST	No	No	No	Yes	Yes	Yes
Adjusted-R^2	0.18	0.34	0.31	0.27	0.12	0.04
Observations	30	30	30	30	30	30

Notes: This table demonstrates that loss aversion estimate of l'Haridon and Vieider (2019) is negatively affected by the temperature volatility (idiosyncratic risk) and positively affected by the temperature spatial correlation (aggregate uncertainty). Additional Geographic Controls land suitability, distance to coast or river, elevation, absolute latitude, percentage of land in the tropical, subtropical and temperate zones and precipitation level. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

5.2 Individuals Level Analysis (WVS)

This section uses the World Values Survey (WVS) to analyze the effect of intertemporal temperature volatility and spatial correlation on individuals' preferences for job security over other characteristics (salary, colleagues, job satisfaction), in light of the positive association between loss aversion and preference for job security over salary and other characteristics. The effects of temperature volatility and correlation are estimated using the linear probability model via the following empirical specification:

$$job_{icw}^{sec} = \beta_0 + \beta_1^{vol} temp_c^{vol} + \beta_1^{corr} temp_c^{corr} + \sum_j \gamma_{0j} X_{cj} + \gamma_1 yst_c + \sum_j \gamma_{2j} Z_{icj} + \sum_{cw} \gamma_{cw} \delta_{cw} + \epsilon_{icw} \tag{43}$$

where $job^{sec}_{icw} \in \{0; 1\}$ is the valuation of job security over other job characteristics[30] of individual i in country c measured in wave w, $temp^{vol}_c$ and $temp^{corr}_c$ are measured in the country c, X_{cj} is geographical characteristic j (absolute latitude, mean elevation, mean temperature, mean level and gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in tropical, subtropical and temperate zones and precipitation level) of the country c, yst_c are the years since the country c transitioned to agriculture, Z_{icj} is characteristic j of individual i (age, gender, number of siblings, religion, education level, income) in country c, δ_{cw} is a complete set of world bank regions and wave fixed effects and ϵ_{icw} is the error term. The theory predicts negative effect of temperature volatility and positive effect of temperature spatial correlation (i.e., $\beta^{vol}_1 < 0$ and $\beta^{corr}_1 > 0$).

Table 8: Determinants of Loss Aversion: Individuals in the WVS

	Preferred Job Characteristic: Security vs Others						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Temperature (Volatility)	-0.060***	-0.063***	-0.049***	-0.031***	-0.031***	-0.031***	
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)	
Temperature (Spatial Correlation)	0.013***	0.014***	0.016***	0.021***	0.020***	0.017***	
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	
Temperature (Volatility, Ancestral)							-0.023***
							(0.007)
Temp (Spatial Correlation, Ancestral)							0.010***
							(0.004)
Temperature (Mean)	-0.016***	-0.010	0.008	0.043***	0.050***	0.046***	0.047***
	(0.005)	(0.007)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Absolute Latitude		0.010	0.011	0.041***	0.074***	0.069***	0.059***
		(0.007)	(0.010)	(0.011)	(0.012)	(0.011)	(0.011)
Elevation (Mean)	-0.023***	-0.021***	0.013***	0.024***	0.014***	0.010**	0.009*
	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Land Suitability (Mean)			0.028***	0.042***	0.018***	0.017***	0.017***
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Neolithic Transition Timing					0.061***	0.058***	0.055***
					(0.005)	(0.005)	(0.005)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes
Wave FE	No	No	No	Yes	Yes	Yes	Yes
Individual Controls	No	No	No	No	No	Yes	Yes
Adjusted-R^2	0.02	0.02	0.03	0.03	0.03	0.04	0.04
Observations	130933	130933	130933	130933	130933	130933	130933

Notes: Using OLS regression, this table suggests that individuals' valuation of job security vs other job characteristics (i.e., salary, colleagues, job satisfaction) is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the country of birth. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust clustered standard error estimates are reported in parentheses; clustering at the region of interview and individual characteristics level; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

Table 8 demonstrates a negative statistically and economically significant effect of temperature volatility and positive significant effect of temperature spatial correlation on individuals' preferences of job security versus other

[30] The preferences of job security versus other characteristics is measured based on the answer to the question "Now I would like to ask you something about the things which would seem to you, personally, most important if you were looking for a job. Here are some of the things many people take into account in relation to their work. Regardless of whether you're actually looking for a job, which one would you, personally, place first if you were looking for a job?", the variable is coded 1 if the answer is "A safe job with no risk of closing down or unemployment" and 0 otherwise

characteristics. The result is robust to the inclusion of world bank regional fixed effects (column 1), geographical controls (columns 2 and 3), wave fixed effects (column 4), the number of years since transition to agriculture (column 5) and individual characteristics (column 6). The estimated effects suggest that increasing intertemporal temperature volatility by one standard deviation decreases the probability of preferring job security to other characteristics by between 6.3 and 3.1 percentage points, while one standard-deviation increase in temperature spatial correlation increases this probability by between 1.3 and 2 percentage points.

Moreover, result remains qualitatively the same after accounting for the ancestral composition of the contemporary population (column 7). In particular, both effects remain significant at the 1% level and imply that one standard-deviation increase in temperature volatility decreases the probability of job security being the most preferred job characteristic by 2.3 percentage points, while increasing temperature spatial correlation by one standard deviation increases it by 1 percentage point.

As demonstrated in the Appendix D.2, the results are robust to: (a) the use of an alternative estimation method: Probit, (b) controls for preindustrial development, and (c) accounting for selection on unobservable.

6 Concluding Remarks

This research explores the origins of loss aversion and the variation in the prevalence of this important traits across regions, nations, and ethnic groups. It advances the hypothesis and establishes empirically that the evolution of loss aversion in the course of human history can be traced to the adaptation of individuals to the asymmetric effects of climatic shocks on reproductive success during the Malthusian epoch; an era in which adverse climatic conditions could have brought individuals to extinction.

The study develops an evolutionary theory that captures the fundamental asymmetry that the Malthusian environment has generated with respect to the attitude of individuals towards gains and losses in productivity, and thus with respect to the evolution of loss aversion. Exploiting variations in the degree of loss aversion among second generation migrants in Europe and the US, as well as across precolonial ethnic groups and countries, the research suggests that consistent with the predictions of the theory, individuals and ethnic groups that are originated in regions in which climatic conditions tended to be spatially correlated, and thus shocks were aggregate in nature, are characterized by greater intensity of loss aversion, while descendants of regions marked by climatic volatility have greater propensity towards loss-neutrality.

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Appendix (Supplementary Online Material)

A Alternative Preferences and Constraints

A.1 Climate and the Evolution of Risk Aversion vs. Loss Aversion

This subsection suggests that the testable predictions about the effect of climatic characteristics on the evolution of loss aversion, as presented in the baseline model, are not applicable to the evolution of constant relative risk aversion. In particular, the section establishes that:

(a) If the subsistence consumption constraint is binding, in contrast to the evolution of loss-aversion, the prevalence of higher constant relative risk aversion may be affected positively by climatic volatility and negatively by the spatial correlation in climatic shocks.

(b) There is no systematic relationship between climatic characteristics and the evolution of the parameter of constant relative risk aversion.

A.1.1 The evolution of risk aversion

Suppose that the subsistence consumption constraint is present and binding, but individuals are loss-neutral (i.e., $\theta_i = 1$). Namely, the subsistence consumption is not a reference point and there is no kink in the utility function at the point, $\tilde{c}$.

Consider the baseline model. Suppose that individuals are loss-neutral, but they differ in the degree of risk aversion with respect to consumption. In particular, suppose the level of utility of an adult i in period t, u_{it}, is:

$$u_{it} = u_i(c_{it}, n_{it}) = (1-\gamma)c_{it}^{1-\sigma_i}/(1-\sigma_i) + \gamma \ln(n_{it} + \epsilon), \tag{44}$$

where $\sigma_i \in [0; \infty)$ is the coefficient of relative risk aversion of individual i, and $\gamma \in (0; 1)$ is relative preference for children.

Proposition A.1. *There exist feasible pairs $(y^l, \tilde{c})$, such that the long-run level of constant relative risk aversion in the population, $\bar{\sigma}$, is affected:*

(i) positively by the climatic volatility and negatively by the spatial correlation of the climatic shocks, i.e.,

$$\partial\bar{\sigma}/\partial\Delta > 0; \quad \partial\bar{\sigma}/\partial\mu < 0.$$

(i) negatively by the climatic volatility and positively by the spatial correlation of the climatic shocks, i.e.,

$$\partial\bar{\sigma}/\partial\Delta < 0; \quad \partial\bar{\sigma}/\partial\mu > 0.$$

Proof. Individuals choose their desirable mode of production prior to the realization of the climatic conditions. Their choices are designed to maximize their expected utility, conditional on the expected probability distribution of the climatic shocks. These choices may differ across individuals based on their degree of risk aversion.

The expected utility u_{it}^r, generated by adult i in period t who chooses the risky production mode, is

$$\begin{aligned} u_{it}^r &= p\left[\gamma\ln(\frac{y^h-\tilde{c}}{\rho y^h}+\epsilon)+(1-\gamma)\tilde{c}^{1-\sigma_i}/(1-\sigma_i)\right]+(1-p)\left[(1-\gamma)(y^l)^{1-\sigma_i}/(1-\sigma_i)+\gamma\ln\epsilon\right] \\ &\equiv u^r(\sigma_i). \end{aligned} \tag{45}$$

Analogously, the utility, u_{it}^s, generated by adult i in period t who chooses the safe production mode is

$$u_{it}^s = \gamma\ln(1+\epsilon)+(1-\gamma)\tilde{c}^{1-\sigma_i}/(1-\sigma_i) \equiv u^s(\sigma_i). \tag{46}$$

Let $u^{r-s}(\sigma_i)$ be the difference between the utility generated by individual i in risky and safe production modes of production:

$$\begin{aligned} u^{r-s}(\sigma_i) &\equiv u^r(\sigma_i)-u^s(\sigma_i) \\ &= (1-p)(1-\gamma)[(y^l)^{1-\sigma_i}/(1-\sigma_i)-\tilde{c}^{1-\sigma_i}/(1-\sigma_i)]+a, \end{aligned} \tag{47}$$

where $a \equiv p\ln(\frac{y^h-\tilde{c}}{\rho y^h}+\epsilon)+(1-p)\ln(\epsilon)-\ln(1+\epsilon)$ is a constant.

Hence, individual i chooses the risky production mode when $u^{r-s}(\sigma_i)>0$ and the safe mode otherwise.

There exist feasible pairs, $(y^l,\tilde{c})$, such that

(i) greater degree of risk aversion reduces the relative attractiveness of the risky production mode:

$$du^{r-s}(\sigma_i)/d\sigma_i < 0;$$

(ii) greater degree of risk aversion increases the relative attractiveness of the risky production mode:

$$du^{r-s}(\sigma_i)/d\sigma_i > 0.$$

The existence of such pairs is established in the following two examples:

Example 1. Assume that $\tilde{c}=1$ and $y^l<1$. In this case the derivative of relative attractiveness of risky production mode, $u^{r-s}(\sigma_i)$, with respect to individual's level of relative risk aversion, σ_i, is

$$\frac{du^{r-s}(\sigma_i)}{d\sigma_i} = (1-p)(1-\gamma)\frac{(y^l)^{1-\sigma_i}-(y^l)^{1-\sigma_i}\ln[(y^l)^{1-\sigma_i}]-1}{(1-\sigma_i)^2}. \tag{48}$$

In general, the numerator of the right hand side expression in (48) is a function $f(x)=x-x\ln x-1$, which takes non-positive values $\forall x>0$, which, in light of the fact that $y^l>0$, implies that $du^{r-s}(\sigma_i)/d\sigma_i \leq 0$. This implies that greater degree of risk aversion reduces relative attractiveness of the risky production mode.

In addition, if $u^{r-s}(0)>0$, there exists a unique and time invariant level of relative risk aversion $\hat{\sigma}$ at which $u^r(\hat{\sigma})=u^s(\hat{\sigma})$ and the risky production mode is preferred by less risk averse individuals with $\sigma_i<\hat{\sigma}$, while the safe production mode is chosen by more risk averse individuals with $\sigma_i \geq \hat{\sigma}$.

Example 2. Assume now that $\tilde{c} > 1$ and $y^l = 1$. In this case the derivative of relative attractiveness of risky production mode, $u^{r-s}(\sigma_i)$, with respect to individual's level of relative risk aversion, σ_i, is

$$\frac{du^{r-s}(\sigma_i)}{d\sigma_i} = (1-p)(1-\gamma)\frac{-\tilde{c}^{1-\sigma_i} + \tilde{c}^{1-\sigma_i}\ln[\tilde{c}^{1-\sigma_i}] + 1}{(1-\sigma_i)^2}. \tag{49}$$

In this case, the numerator of the right hand side expression in (49) is a function $g(x) = -x + x\ln x + 1 = -f(x)$, which takes non-negative values $\forall x > 0$, which, in light of the fact that $\tilde{c} > 0$, implies that $du^{r-s}(\sigma_i)/d\sigma_i \geq 0$. This means that greater degree of risk aversion in fact increases relative attractiveness of the risky production mode, in contrast to the previous example.

In addition, if there exists a unique and time invariant level of relative risk aversion $\hat{\sigma}$ at which $u^r(\hat{\sigma}) = u^s(\hat{\sigma})$ the risky production mode is preferred by more risk averse individuals with $\sigma_i > \hat{\sigma}$, while the safe production mode is chosen by less risk averse individuals with $\sigma_i \leq \hat{\sigma}$.

The intuition behind this surprising result stems from the fact that both the safe production mode and the good realization of the risky production, in the presence of the consumption subsistence constraint, grant the same level of consumption, $\tilde{c}$. This implies, that the difference between the expected utility from the risky and safe production modes is proportional to the difference

$$(y^l)^{1-\sigma}/(1-\sigma) - \tilde{c}^{1-\sigma}/(1-\sigma), \tag{50}$$

for which the global monotonic relation to σ can not be identified.

Corollary A.2. *If there exist a unique critical level of relative risk aversion, $\hat{\sigma}$, such that $u^r(\hat{\sigma}) = u^s(\hat{\sigma})$, then the effect of climatic volatility on $\hat{\sigma}$ is ambiguous:*

(i) There exist pairs $(y^l, \tilde{c})$ such that the critical level of risk aversion, $\hat{\sigma}$, is reduced by greater degree of volatility, Δ;

$$d\hat{\sigma}/d\Delta < 0;$$

(ii) There exist pairs $(y^l, \tilde{c})$ such that the critical level of risk aversion, $\hat{\sigma}$, increases by greater degree of volatility, Δ;

$$d\hat{\sigma}/d\Delta > 0.$$

Proof. If there exists a unique level of relative risk aversion, $\hat{\sigma}$, such that $u^{r-s}(\hat{\sigma}) = 0$, the derivative of $\hat{\sigma}$ with respect to volatility level Δ can be found using the *Implicit Function Theorem*, namely:

$$\frac{d\hat{\sigma}}{d\Delta} = -\frac{du^{r-s}/d\Delta}{du^{r-s}/d\sigma}. \tag{51}$$

By construction, the degree of volatility only affects income in the bad realization of the climatic shock, y_l, in particular $dy_l/d\Delta < 0$. This implies that unambiguously

$$\frac{du^{r-s}}{d\Delta} = \frac{du^{r-s}}{dy^l}\frac{dy^l}{d\Delta} = (1-p)(1-\gamma)(y^l)^{-\hat{\sigma}}\frac{dy^l}{d\Delta} < 0. \tag{52}$$

As a result, whenever $du^{r-s}/d\sigma < 0$, like in the Example 1, (51) implies $d\hat{\sigma}/d\Delta < 0$, and, whenever $du^{r-s}/d\sigma > 0$, like in the Example 2, $d\hat{\sigma}/d\Delta > 0$.

Corollary A.3. *Climatic volatility affects the evolution of risk aversion in the population in an ambiguous way. Namely,*
(i) There exist feasible pairs $(y^l, \tilde{c})$ such that $d\bar{\sigma}/d\Delta < 0$, (i.e., greater degree of volatility reduces the long run average level of risk aversion in the population, $\bar{\sigma}$).
(ii) There exist feasible pairs $(y^l, \tilde{c})$ such that $d\bar{\sigma}/d\Delta > 0$, (i.e., greater degree of volatility reduces the long run average level of risk aversion in the population, $\bar{\sigma}$).

Proof. Following the logic of Section 2.4, whenever there exists such unique time invariant level of risk aversion, $\hat{\sigma}$, that $u^{r-s}(\hat{\sigma}) = 0$ and $u^{r-s}(\sigma_i)$ is monotonic in σ_i, individuals sort themselves into risky and safe production modes, which grant them identical asymptotic reproductive success within each production mode. This implies that in the long run only one group dominates determining the average level of risk aversion in the population.

For simplicity, assume that the initial distribution of risk aversion in the population is uniform on $[0, \sigma^u]$.[31] Whenever a unique cut off point $\hat{\sigma}$ exists, the average level of risk aversion in each group is equal to $\hat{\sigma}/2$ and $(\hat{\sigma} + \sigma^u)/2$. This implies that the long run level of risk aversion, , is equal to either $\hat{\sigma}/2$ or $(\hat{\sigma} + \sigma^u)/2$, meaning that no matter how individuals sort themselves and which group actually dominates in the long run, the effect of climatic volatility on the average long run level of risk aversion in the population is proportional to the effect of climatic volatility on the cut off level $\hat{\sigma}$. In particular:

$$\frac{d\bar{\sigma}}{d\Delta} = \frac{1}{2}\frac{d\hat{\sigma}}{d\Delta}. \tag{53}$$

In light of the Corollary A.2 this implies that there exist cases such that greater climatic volatility reduces average long run level of risk aversion in the population, $d\bar{\sigma}/d\Delta < 0$, as well as cases in which greater climatic volatility increases average long run level of risk aversion in the population, $d\bar{\sigma}/d\Delta > 0$. This implies, that there is no consistent prediction over the effect of climatic volatility on the evolution of risk aversion.

Corollary A.4. *Evolution of risk aversion in the population is affected by the spatial correlation of climatic shocks in an ambiguous way.*

Proof. Since assumptions over the structure of climatic shocks are identical to the baseline model, it is still true that in the long run individuals who pick the risky production mode dominate the society whenever the correlation

[31] In principal the support of the distribution of σ_i doesn't have to be bounded, this example is picked for representative reason and the upper bound of distribution, σ^u, can be arbitrarily high.

of the climatic shocks is low enough, $\mu < \hat{\mu}$, while individuals who pick the risky mode dominate otherwise, $\mu > \hat{\mu}$, both groups coexist if $\mu = \hat{\mu}$.[32] However, in light of the Claim A.1.1 this implies inconsistency of the predictions.

In particular, in cases when there exists level $\hat{\sigma}$ such that $u^{r-s}(\hat{\sigma}) = 0$ and $du^{r-s}(\sigma)/d\sigma < 0$ (e.g., the Example 1) more risk averse individuals with $\sigma_i \in [\hat{\sigma}, \sigma^u]$ prefer safe production mode, $u^{r-s}(\sigma_i) < 0$, while less risk averse individuals with $\sigma_i \in [0, \hat{\sigma})$ choose the risky one, $u^{r-s}(\sigma_i) > 0$. This implies that the long run level of risk aversion, $\bar{\sigma}$, is a following function of the climatic shocks spatial correlation, μ:

$$\bar{\sigma} = \begin{cases} \frac{\hat{\sigma}}{2} & if \quad \mu > \hat{\mu} \\ \frac{\sigma^u}{2} & if \quad \mu = \hat{\mu} \\ \frac{\sigma^u + \hat{\sigma}}{2} & if \quad \mu < \hat{\mu}. \end{cases} \tag{54}$$

Sorting of individuals into production modes reverses if $du^{r-s}(\sigma)/d\sigma > 0$ (e.g., the Example 2). In such cases, if there exists level $\hat{\sigma}$ such that $u^{r-s}(\hat{\sigma}) = 0$, more risk averse individuals with $\sigma_i \in [\hat{\sigma}, \sigma^u]$ in fact prefer the risky production mode, $u^{r-s}(\sigma_i) < 0$, while less risk averse individuals, with $\sigma_i \in [0, \hat{\sigma})$, choose the safe one, $u^{r-s}(\sigma_i) > 0$. This implies that the long run level of risk aversion, $\bar{\sigma}$, is a following function of the climatic shocks spatial correlation, μ:

$$\bar{\sigma} = \begin{cases} \frac{\hat{\sigma} + \sigma^u}{2} & if \quad \mu > \hat{\mu} \\ \frac{\sigma^u}{2} & if \quad \mu = \hat{\mu} \\ \frac{\hat{\sigma}}{2} & if \quad \mu < \hat{\mu}, \end{cases} \tag{55}$$

As a result, the effect of the climatic shocks spatial correlation on the evolution of risk aversion in the population is ambiguous.

A.2 Evolution of Loss Aversion: Alternative Utility Functions & Constraints

This subsection shows that the theoretical predictions are robust to the use of the utility function in which:

(a) loss aversion with respect to fertility is present;

(b) differential level of constant relative risk aversion with respect to consumption and fertility are assumed;

(c) consumption below subsistence is associated with death;

(d) more general functional form is assumed;

(e) the reference point adjusts to changes in the subsistence level.

[32] Note that this result is independent from the utility functional form and depends solely on the relative reproductive success of individuals with different production modes in the long run. Since the assumptions over the structure of production and climatic shocks are unaltered, the predictions of the baseline model with this respect are unchanged.

A.2.1 Loss Aversion with Respect to Fertility and Consumption

This subsection demonstrates that the predictions of the baseline model regarding the effect of climatic volatility and spatial correlation on the evolution of loss aversion remain unaltered if loss aversion is defined over both consumption and fertility.

Suppose that individuals are loss averse with respect to both consumption and fertility. In general, this would require the introduction of separate degrees of loss aversion and reference points with respect to consumption and fertility.

Suppose the level of utility of an adult i in period t, u_{it}, is:

$$u_{it} = \begin{cases} [f(c_{it}) - f(\tilde{c})] + [w(n_{it}) - w(\tilde{n})] & if\ \ c_{it} \geq \tilde{c}\ \ and\ \ n_{it} \geq \tilde{n} \\ \frac{1}{\theta_i}[g(c_{it}) - g(\tilde{c})] + [w(n_{it}) - w(\tilde{n})] & if\ \ c_{it} < \tilde{c}\ \ and\ \ n_{it} \geq \tilde{n} \\ [f(c_{it}) - f(\tilde{c})] + \frac{1}{\eta_i}[z(n_{it}) - z(\tilde{n})] & if\ \ c_{it} \geq \tilde{c}\ \ and\ \ n_{it} < \tilde{n} \\ \frac{1}{\theta_i}[g(c_{it}) - g(\tilde{c})] + \frac{1}{\eta_i}[z(n_{it}) - z(\tilde{n})] & if\ \ c_{it} < \tilde{c}\ \ and\ \ n_{it} < \tilde{n}, \end{cases} \tag{56}$$

where $\frac{1}{\eta_i} \in [0, \infty)$ represents the level of loss aversion with respect to fertility and $\tilde{n}$ is the corresponding reference point. Furthermore, functions $f(\cdot)$ and $w(\cdot)$ are concave and monotonically increasing, representing risk aversion with respect to gains, while $g(\cdot)$ and $z(\cdot)$ are convex , reflecting risk loving for losses. Similar to the logic in the baseline model, zero fertility is the natural candidate for the reference point, $\tilde{n} = 0$, since it corresponds to the critical level of income, $y_{it} = \tilde{c}$, below which the consumption subsistence constraint becomes binding.

Proposition A.5. *The effect of climatic volatility and spatial correlation on the evolution of loss aversion remain unaltered under the specification of the utility function, characterized by the presence of loss aversion over both consumption and fertility.*

Proof.

In light of this assumption and structure of the constraints, cases where $c_{it} \geq \tilde{c}$ and $n_{it} < \tilde{n}$, as well as $c_{it} < \tilde{c}$ and $n_{it} \geq \tilde{n}$ become unfeasible (e.g., if consumption falls below the critical level $\tilde{c}$, by design the fertility is at its reference point, $\tilde{n}$, and vice verse). As a result, the utility of individual i in period t is:

$$u_{it} = \begin{cases} [f(c_{it}) - f(\tilde{c})] + [w(n_{it}) - w(\tilde{n})] & if\ \ c_{it} \geq \tilde{c}\ \ and\ \ n_{it} \geq \tilde{n} \\ \frac{1}{\theta_i}[g(c_{it}) - g(\tilde{c})] + \frac{1}{\eta_i}[z(n_{it}) - z(\tilde{n})] & if\ \ c_{it} < \tilde{c}\ \ and\ \ n_{it} < \tilde{n}. \end{cases} \tag{57}$$

In other words, individual is either at a loss with respect to both consumption and fertility, or at a gain along both of the dimensions. In a particular case, when the level loss aversion is equal for consumption and fertility, $\theta_i = \eta_i$, the preference are subjected to a loss aversion over all utility, which takes the form of:

$$u_{it} = u_i(c_{it}, n_{it}) = \begin{cases} [f(c_{it}) - f(\tilde{c})] + [w(n_{it}) - w(\tilde{n})] & if \;\; (c_{it}, n_{it}) >> (\tilde{c}, \tilde{n}) \\ 0 & if \;\; (c_{it}, n_{it}) \;=\; (\tilde{c}, \tilde{n}) \\ \frac{1}{\theta_i}\{[g(c_{it}) - g(\tilde{c})] + \gamma[z(n_{it}) - z(\tilde{n})]\} & if \;\; (c_{it}, n_{it}) << (\tilde{c}, \tilde{n}). \end{cases} \tag{58}$$

Given the same structure of the production, shocks and constraints as in the baseline specification, The expected utility, u^r_{it}, generated by an adult i in a period t who chooses the risky production mode, is

$$\begin{aligned} u^r_{it} &= p\left[w\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) - w(0)\right] + (1-p)\frac{1}{\theta_i}\left[g(y^l) - g(\tilde{c})\right] \\ &\equiv u^r(\theta_i), \end{aligned} \tag{59}$$

Similarly to the baseline model, it can be concluded from (59) that

$$\lim_{\theta \to 0} u^r(\theta_i) = -\infty \quad and \quad \frac{du^r(\theta_i)}{d\theta_i} > 0 \quad \forall \theta_i \in (0;1). \tag{60}$$

The utility u^s_{it}, generated by adult i in period t who chooses the safe production mode, is

$$u^s_{it} = w(1) - w(0) \equiv u^s. \tag{61}$$

Assuming that the risky production mode is sufficiently attractive to assure that at least loss-neutral individuals prefers it (i.e., $u^r(1) > u^s$), it follows from the *Intermediate Value Theorem* that there exists a unique and time invariant level of the parameter of loss neutrality , $\hat{\theta} \in (0;1)$, such that $u^r(\hat{\theta}) = u^s$. In particular

$$\hat{\theta} = \frac{(1-p)\left[g(\tilde{c}) - g(y^l)\right]}{\left[pw\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) + (1-p)w(0) - w(1)\right]} \equiv \hat{\theta}(\Delta), \tag{62}$$

which is identical to the cut off point found in the baseline case.

This necessarily implies that alternative specification of loss aversion in the utility function will generate identical prediction over the evolution of loss aversion with respect to climatic volatility and spatial correlation.

A.2.2 Death below the Subsistence Consumption Constraint

This subsection considers the case in which consumption below the subsistence level causes a death of the individual instead of infertility.

Death due to consumption level below subsistence implies that level of utility of individuals who chose the risky mode is unaffected by the severity of the adverse realization. Hence in this generate and unrealistic case cannot be used to shed light on the relationship between climatic volatility the evolution of loss aversion. However, as was established in the baseline model, the greater is the spatial correlation in climatic shocks, the higher is the degree of loss aversion.

Proposition A.6. *If consumption below the subsistence level causes a death of the individual instead of infertility there is no selection of loss aversion with respect to climatic volatility but effects of climatic shocks spatial correlation are unchanged.*

Proof. Assume that in the baseline model the consumption subsistence constraint implies that whenever the consumption of an individual falls below the level of $\tilde{c}$ she immediately dies and, as a result, can not reproduce.

If the disutility from being dead, δ, is unbounded (i.e., infinitely large), any production mode that with non-zero probability generates a level of income below subsidence (e.g., risky production mode in the baseline model) will not be chosen by any individual in the population, independently from the level of loss aversion. As a result, no evolutionary dynamics in this dimension will take place.

If, on the other hand, disutility from death is bounded, $\delta < \infty$, some of the individuals might still choose to engage in the production modes, that can result in the consumption being below $\tilde{c}$. In particular, they will make the decision based on the maximization of the expected utility. Under these assumptions, the utility level of an adult i in period t, u_{it}, is:

$$u_{it} = u_i(c_{it}, n_{it}) = \begin{cases} [g(c_{it}) - g(\tilde{c})] + w(n_{it}) & if \;\; c_{it} \geq \tilde{c} \\ -\delta/\theta_i & if \;\; c_{it} < \tilde{c}, \end{cases} \tag{63}$$

which reflects the fact that whenever the consumption of an individual falls below the subsistence level $\tilde{c}$, which is also set to be a reference level with respect to which individual identifies losses and gains, individual dies from malnourishment, receives a disutility from death, δ, multiplied by an additional degree of loss aversion $1/\theta_i \in [0; \infty)$. In this particular case, the loss is identified as a case of individual's death, so the total disutility from death, δ/θ_i, increases in the individual level of loss aversion.

Given the same structure of the production, shocks and the budget constraint as in the baseline specification, the expected utility, u^r_{it}, generated by an adult i in a period t who chooses the risky production mode, is

$$\begin{aligned} u^r_{it} &= pw\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) - (1-p)\frac{1}{\theta_i}\delta \\ &\equiv u^r(\theta_i). \end{aligned} \tag{64}$$

Similarly to the baseline model, (64) implies

$$\lim_{\theta \to 0} u^r(\theta_i) = -\infty \quad and \quad \frac{du^r(\theta_i)}{d\theta_i} > 0 \quad \forall \theta_i \in (0; 1). \tag{65}$$

The utility u^s_{it}, generated by adult i in period t who chooses the safe production mode, is

$$u^s_{it} = w(1) \equiv u^s. \tag{66}$$

Assuming that the risky production mode is sufficiently attractive to assure that at least loss-neutral individuals prefers it (i.e., $u^r(1) > u^s$), it follows from the *Intermediate Value Theorem* that there exists a unique and time invariant level of the parameter of loss neutrality , $\hat{\theta} \in (0;1)$, such that $u^r(\hat{\theta}) = u^s$. In particular

$$\hat{\theta} = \frac{(1-p)\delta}{\left[pw\left(\frac{y^h-\tilde{c}}{\rho y^h}\right) - w(1)\right]}. \tag{67}$$

As apparent from (67), the critical level of loss neutrality, $\hat{\theta}$, is independent from the volatility of climatic shock, $d\hat{\theta}/d\Delta = 0$. This is the result of volatility not having any effect on the utility in the bad realization of the risky production, which leads to death independent of the magnitude of the shock and grants the same level of utility in any case. As a consequence, the evolutionary effect of climatic volatility on loss aversion can not be replicated under this specific formulation of the subsistence constraint.

At the same time, there still exists a non trivial sorting of individuals in terms of production mode choice, which is based on the level of loss aversion. Namely, more loss neutral individuals, with $\theta_i \in (\hat{\theta}, 1]$, choose the risky mode of production, while those who are more loss averse, individuals with $\theta_i \in [0, \hat{\theta}]$, prefer the safe one. Given the same structure of the aggregate and idiosyncratic shocks as in the baseline specification, uniform distribution of θ_i on $(0;1)$ at period 0, and the fact that dead individuals can not reproduce, this implies that the long-run level of loss neutrality in the population, $\bar{\theta}$, is equal to

$$\bar{\theta} = \begin{cases} \frac{\hat{\theta}}{2} & if \quad \mu > \hat{\mu} \\ \frac{1}{2} & if \quad \mu = \hat{\mu} \\ \frac{1+\hat{\theta}}{2} & if \quad \mu < \hat{\mu}, \end{cases} \tag{68}$$

which is identical to the baseline result, implying that the effect of spatial correlation of shocks on the evolution of loss aversion in the population is preserved.

A.2.3 Robustness to a More Generalized Form of the Utility Function

This subsection demonstrates that the theoretical predictions are robust to the use of a more generalized form of the utility function.

Consider the utility function:

$$u_{it} = u_i(c_{it}, n_{it}) = \begin{cases} [f(c_{it}) - f(\tilde{c})] + w(n_{it}) & if \;\; c_{it} \geq \tilde{c} \\ \frac{1}{\theta_i}[g(c_{it}) - g(\tilde{c})] + w(n_{it}) & if \;\; c_{it} < \tilde{c}, \end{cases} \tag{69}$$

where the functions $f(\cdot)$, $g(\cdot)$ and $w(\cdot)$ are only monotonically increasing functions and $w(0) > -\infty$. In particular, $g(\cdot)$ could be concave instead of convex. The normalization of utility from consumption to 0, at the reference point

$\tilde{c}$, is necessary for a correct specification of loss aversion, as was the case in the baseline specification. Note that a non-separable utility can be used, although this would pose a non-trivial question about the modeling of the kink associated with loss aversion in a two dimensional space.

To assure the consistency of the model with a Malthusian economy under consumption subsistence constraint, suppose further that, if income exceeds the $\tilde{c}$, individual consumes the amount needed for subsistence and spends the rest of the income on child-rearing, whereas if the income falls below that, it is fully consumed.

Following the notations and assumptions made in the baseline model with respect to the production structure, the choice between the two production modes is made by comparing the expected utility from the risky mode:

$$u_{it}^r \equiv pw\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) + (1-p)\left[\frac{1}{\theta_i}(g(y^l) - g(\tilde{c})) + w(0)\right] \equiv u^r(\theta_i),$$

and utility from the safe mode:

$$u_{it}^s = w(1) \equiv u^s$$

As long as the risky mode is preferred by individuals who are indifferent to losses (i.e., with $1/\theta = 0$),[33] there exists a level of $\hat{\theta}$ such that:

$$u^r(\hat{\theta}) = u^s$$

Namely:

$$\hat{\theta} = \frac{(1-p)\left[g(\tilde{c}) - g(y^l)\right]}{pw(\frac{y^h - \tilde{c}}{\rho y^h}) + (1-p)w(0) - w(1)}$$

Noting that y^l is a decreasing function of Δ and y^h is orthogonal to Δ, it follows that

$$d\hat{\theta}/d\Delta > 0.$$

This result is qualitatively identical to that derived in the baseline model, leading to the same dynamical structure to the one derived in the baseline model and generating identical testable predictions.

A.2.4 The Emergence of Convexity with respect to Losses

This subsection explores the evolutionary forces that governed the shape of utility function with respect to losses in consumption. It establishes that under some conditions, convexity with respect to losses emerges as an evolutionary dominating feature of the utility function.

[33] i.e., as long as y^h is high enough so that $pw(\frac{y^h - \tilde{c}}{\rho y^h}) + (1-p)w(0) > w(1)$; otherwise the risky mode would not be picked by any individual and the evolutionary dynamics would be trivial.

Suppose that individuals are confronted by two risky production modes, rather than a risky and a safe one:

- Less risky Production Mode 1

$$y^1_{it} = \begin{cases} y^l + \Delta^1 & with\, probability \quad \frac{1}{2} \\ \\ y^l - \Delta^1 & with\, probability \quad \frac{1}{2} \end{cases}$$

- More risky Production Mode 2

$$y^1_{it} = \begin{cases} y^l + \Delta^2 & with\, probability \quad \frac{1}{2} \\ \\ y^l - \Delta^2 & with\, probability \quad \frac{1}{2} \end{cases}$$

where

$$y^l + \Delta_1 < \tilde{c} < y^l + \Delta^2 \qquad and \qquad y^l - \Delta^2 > 0$$

In other words, both production modes generate identical expected return, however, production mode 2 has greater dispersion and places individuals above subsistence with positive probability.

In addition suppose that for any level of loss aversion $1/\theta_i$ there are two types of individuals: individuals whose utility function is concave with respect to losses in consumption, as in the baseline model, and individuals whose utility function is convex with respect to losses in consumption. Namely, risk averse individuals have a utility function of the form considered in the baseline model:

$$u^{RA}_{it} = u^{RA}_i(c_{it}, n_{it}) = \begin{cases} f(c_{it}) - f(\tilde{c}) + w(n_{it}) & if \;\; c_{it} \geq \tilde{c} \\ \frac{1}{\theta_i}[g^{RA}(c_{it}) - g^{RA}(\tilde{c})] + w(n_{it}) & if \;\; c_{it} < \tilde{c}, \end{cases} \tag{70}$$

where $g^{RA}(\cdot)$ is a concave function.

Individuals that exhibit risk loving with respect to losses on the other hand have a utility function of the following type:

$$u^{RL}_{it} = u^{RL}_i(c_{it}, n_{it}) = \begin{cases} f(c_{it}) - f(\tilde{c}) + w(n_{it}) & if \;\; c_{it} \geq \tilde{c} \\ \frac{1}{\theta_i}[g^{RL}(c_{it}) - g^{RL}(\tilde{c})] + w(n_{it}) & if \;\; c_{it} < \tilde{c}, \end{cases} \tag{71}$$

where $g^{RL}(\cdot)$ is a convex function.

The difference in the expected utility generated from mode 2 and mode 1, depends of the individual type.

For individuals who are risk averse with respect to losses it is:

$$\mathbb{E}\left[u^{RA}_{it}(y^2_{it}) - u^{RA}_{it}(y^1_{it})\right] = \frac{1}{2} w[n(y^l + \Delta^2)] + \frac{1}{2}\frac{1}{\theta_i}\left[g^{RA}(\tilde{c}) - g^{RA}(y^l + \Delta^1) - g^{RA}(y^l - \Delta^1) + g^{RA}(y^l - \Delta^2)\right],$$

and for the individuals who are risk loving with respect to losses it is:

$$\mathbb{E}\left[u_{it}^{RL}(y_{it}^2) - u_{it}^{RL}(y_{it}^1)\right] = \frac{1}{2}w[n(y^l + \Delta^2)] + \frac{1}{2}\frac{1}{\theta_i}\left[g^{RL}(\tilde{c}) - g^{RL}(y^l + \Delta^1) - g^{RL}(y^l - \Delta^1) + g^{RL}(y^l - \Delta^2)\right].$$

Since the two expression differ only by the second expression, and since $\tilde{c} < y^l + \Delta^2$ and g^{RA} is concave function, it follows that:[34]

$$g^{RA}(\tilde{c}) - g^{RA}(y^l + \Delta^1) - g^{RA}(y^l - \Delta^1) + g^{RA}(y^l - \Delta^2) < 0$$

However, since v^{RL} is a convex function, if g^{RL}, is sufficiently convex,

$$g^{RL}(\tilde{c}) - g^{RL}(y^l + \Delta^1) - g^{RL}(y^l - \Delta^1) + g^{RL}(y^l - \Delta^2) > 0 > g^{RA}(\tilde{c}) - g^{RA}(y^l + \Delta^1) - g^{RA}(y^l - \Delta^1) + g^{RA}(y^l - \Delta^2).$$

Hence, for some parameters Δ^1 and Δ^2 that risk loving individuals choose production mode 2, whereas the risk averse one production mode 1:

$$\mathbb{E}\left[u_{it}^{RA}(y_{it}^2) - u_{it}^{RA}(y_{it}^1)\right] < 0 < \mathbb{E}\left[u_{it}^{RL}(y_{it}^2) - u_{it}^{RL}(y_{it}^1)\right]$$

However, there are no parameter in which the choices will be flipped:

$$\mathbb{E}\left[u_{it}^{RA}(y_{it}^2) - u_{it}^{RA}(y_{it}^1)\right] > 0 > \mathbb{E}\left[u_{it}^{RL}(y_{it}^2) - u_{it}^{RL}(y_{it}^1)\right]$$

From evolutionary point of view, taking risk while being below the reference point is optimal if it permit reproduction with positive probability, and risk loving behaviour with respect to losses would emerge as evolutionary optimal behavior and risk loving individuals will dominate the population in the long run.

A.2.5 Evolution of the Reference Point

This subsection shows that, under some conditions, the adjustment of the reference point to the changes in the subsistence level of consumption emerges as an evolutionary dominant feature of the utility function. Moreover, it demonstrates the robustness of the results to the changes in the reference point.

Consider a modification of the baseline model in which the subsidence level of consumption, $\tilde{c}$, changes over time. Suppose, for simplicity, that individuals are identical in their level of loss aversion, $1/\theta$, but differ in their ability to readjust the reference point. In particular, there are two types of individuals: Type 1 with a reference point equal to the initial level of subsidence consumption, $\tilde{c}$, and Type 2 who can readjust their reference point to the contemporary level of subsistence consumption.

Suppose that given the initial subsistence level, $\tilde{c}$, the risky production mode is evolutionary optimal and the degree of loss aversion among individuals in society is such that this production mode is chosen. It follows that

[34]The difference in differences is negative as follows from Jensen inequality and the concavity of the function.

$$\bar{n}^r(\mu, \tilde{c}) \equiv \log\left[\mu + (1-\mu)p\right] + (1-p)\log\left[(1-\mu)p\right] + \log\left(\frac{y^h - \tilde{c}}{\rho y^h}\right) > 0,$$

and for both types of individuals the difference between expected utility from risky mode and safe mode is positive:

$$u^r_{it} - u^s_{it} = p\left[w\left(\frac{y^h - \tilde{c}}{\rho y^h}\right)\right] + (1-p)\left[\frac{1}{\theta}[g(y^l) - g(\tilde{c})] + w(0)\right] - w(1) > 0. \quad \forall i = 1, 2 \tag{72}$$

If the subsistence level decreases to a level $\tilde{c}^l < \tilde{c}$, the risky production mode is still evolutionary optimal:

$$\bar{n}^r(\mu, \tilde{c}^l) > \bar{n}^r(\mu, \tilde{c}) > 0$$

For individuals with ability to adjustment the reference point (i.e., Type 2), the difference between expected utility from risky mode and safe mode is:

$$u^r_{2t} - u^s_{2t} = p\left[w\left(\frac{y^h - \tilde{c}^l}{\rho y^h}\right)\right] + (1-p)\left[\frac{1}{\theta}[g(y^l) - g(\tilde{c}^l)] + w(0)\right] - w(1) > 0.$$

Hence Type 2 individuals are still choosing evolutionary optimal risky production mode, as follows (72) and the fact that its left hand side is decreasing in $\tilde{c}$. However, for Type 1 individuals of (i.e., those who do not adjust their reference point):

$$u^r_{1t} - u^s_{1t} = p\left[w\left(\frac{y^h - \tilde{c}^l}{\rho y^h}\right) + \frac{1}{\theta}(g(\tilde{c}^l) - g(\tilde{c}))\right] + (1-p)\left[\frac{1}{\theta}[g(y^l) - g(\tilde{c})] + w(0)\right] - w(1)$$

and in light of negativity of $g(\tilde{c}^l) - g(\tilde{c}) < 0$, for some drop in the subsistence level,

$$u^r_{1t} - u^s_{1t} < 0,$$

and individual switch to an evolutionary suboptimal production mode and disappear from the population in the long run.

Similar logic applies to the case in which $\tilde{c}$ increases and the evolutionary optimal strategy becomes a safe mode. Thus, the logic of the model allows us to demonstrate the emergence of reference point readjustment as an evolutionary optimal behaviour if we consider intertemporal changes of subsistence level of consumption.

Furthermore, among the evolutionary dominant group of individuals who adjust their reference point to the changes in subsistence, as long as those changes are not large enough to alter the evolutionary dominant production mode (i.e., $\Delta\tilde{c} \in [\Delta\tilde{c}_l; \Delta\tilde{c}_h]$)[35], the predictions of the baseline model with respect to volatility and spatial correlation of climatic uncertainty are unaltered. In particular, increase in the volatility of temperature is associated with a higher degree of loss neutrality (i.e., lower degree of loss aversion), while increase in the spatial correlation in temperature leads to a lower degree of loss neutrality (i.e., higher degree of loss aversion) in the population in the

[35] The limits to a change in the subsistence level that do not alter the evolutionary optimal production mode are $\Delta\tilde{c}_l = -|c^* - \tilde{c}|$ and $\Delta\tilde{c}_h = |c^* - \tilde{c}|$, where $c^* = y^h + 1/\{\rho y^h[\mu + (1-\mu)p][(1-\mu)p]^{1-p}\}$.

long run, independently of the changes in the subsistence level, $\tilde{c}$.

A.3 Robustness to the Imperfect Intergenerational Transmission

This section demonstrates that the predictions of the model regarding the effect of idiosyncratic and aggregate climatic uncertainty on the average loss aversion in the population are qualitatively identical under the imperfect intergenerational transmission of predisposition towards loss aversion. The robustness is established by simulating the evolution of the composition of the population in terms of predisposition towards loss aversion under different assumptions over the transmission of preference across generations.

Suppose that the intensity of loss neutrality of a child of individual i in period $t+1$, θ_{it+1}, is partially inherited from the parent, θ_{it}, and partially influenced by a population average in a period t, $\bar{\theta}_t$, i.e.,

$$\theta_{it+1} = \lambda\theta_{it} + (1-\lambda)\bar{\theta}_t, \tag{73}$$

where $\lambda \in [0; 1]$ is the level of intergenerational correlation in loss neutrality. In particular, the baseline model corresponds to the perfect transmission of the preference between generations emerges if $\lambda = 1$, while $\lambda < 1$ represents the imperfect intergenerational transmission.

To demonstrate the robustness of the theoretical predictions to various intensities of the degree of the intergenerational correlation in loss aversion (i.e., alternative values of λ), the evolution of the average level of loss neutrality, $\bar{\theta}_t$, is simulated under four different levels of $\lambda \in \{1, 0.75, 0.66, 0.5\}$, each in three different environments characterized by: (i) baseline level of volatility Δ and correlation μ, (ii) baseline level of volatility Δ and increased level of correlation μ', (iii) increased level of volatility Δ' and baseline level of correlation μ, where

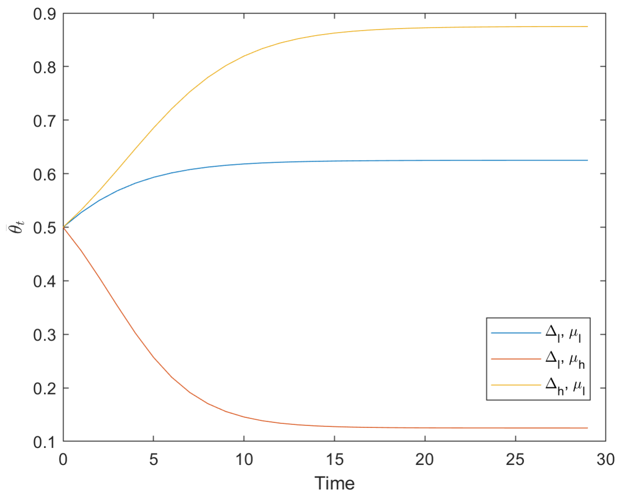
$$\Delta' > \Delta \quad \textit{and} \quad \mu' > \mu \tag{74}$$

The model , given (74), predicts that in the long run the average level of loss neutrality would be higher under higher volatility and lower spatial correlation of climatic shocks (i.e., case iii) and would be lower under lower volatility and higher spatial correlation of climatic shocks (i.e., case ii), while case (i) would generate intermediate level of average loss neutrality, i.e.,

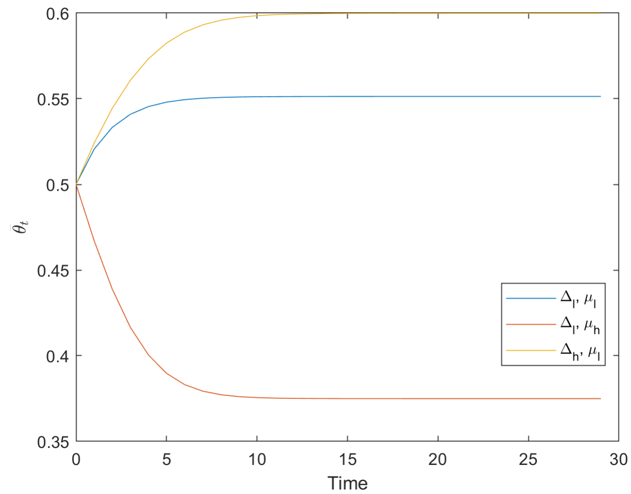
$$\bar{\theta}(\Delta', \mu) > \bar{\theta}(\Delta, \mu) > \bar{\theta}(\Delta, \mu') \tag{75}$$

The simulation of the baseline case (i.e., under $\lambda = 1$) as depicted in panel (a) of Figure A.1 coincides with the theoretical predictions of the baseline model. In particular, starting from the unconditional mean of the initial distribution of loss neutrality in generation 0, the average level of loss neutrality evolves and reaches different long run levels in the three cases: reaching a higher steady state level under increased temperature volatility, Δ', and baseline level of spatial correlation in temperature μ (the yellow line), reaching a lower steady state level under the baseline level of temperature volatility, Δ, and increased level of spatial correlation in temperature μ' (the red line), the intermediate level is observed under baseline levels of temperature volatility, Δ, and spatial correlation in temperature μ (the blue line).

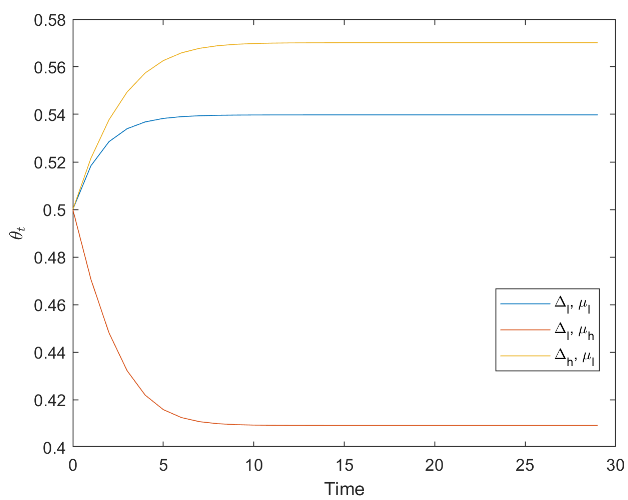
Similar patterns are observed under different assumptions over intergenerational transmission of loss neutrality. For instance, panels (b) – (d) of Figure A.1 indicate identical qualitative results under levels of integenerational correlation, λ, that are lower than one. Under the imperfect intergenerational transmission of loss aversion, increase in temperature volatility results in a higher level of average loss neutrality (i.e., lower level of loss aversion), while increase in temperature spatial correlation leads to a lower level of average loss neutrality (i.e., higher level of loss aversion) in the long run, although the magnitude of the effect being lower.



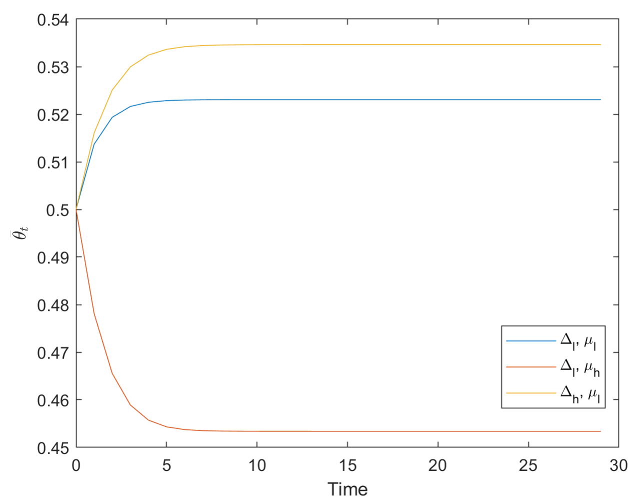
(a) $\lambda = 1$



(b) $\lambda = 0.75$



(c) $\lambda = 0.67$



(d) $\lambda = 0.5$

Figure A.1: Evolution of average level of Loss Neutrality $\bar{\theta}_t$

B The Global Distribution of Climate and Loss Aversion

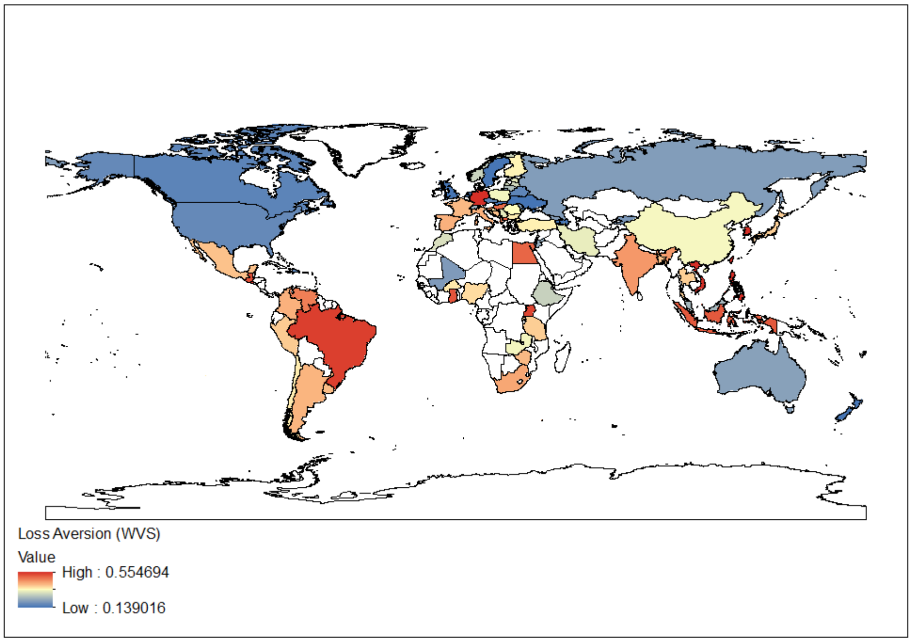


Figure B.1: The Global Distribution of Loss Aversion as captured by the WVS

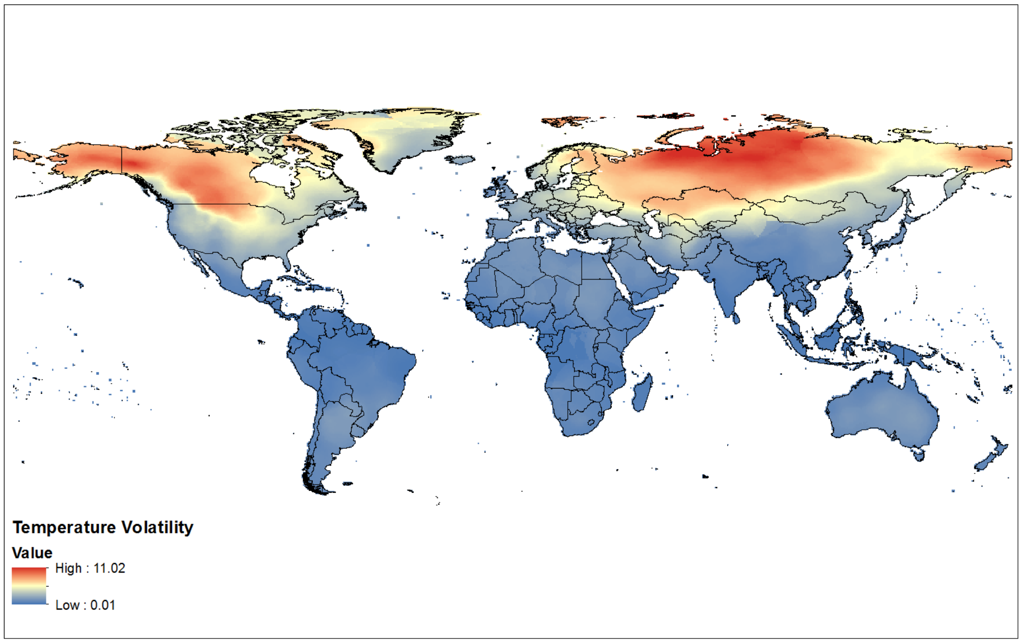


Figure B.2: The Global Distribution of Intertemporal Temperature Volatility

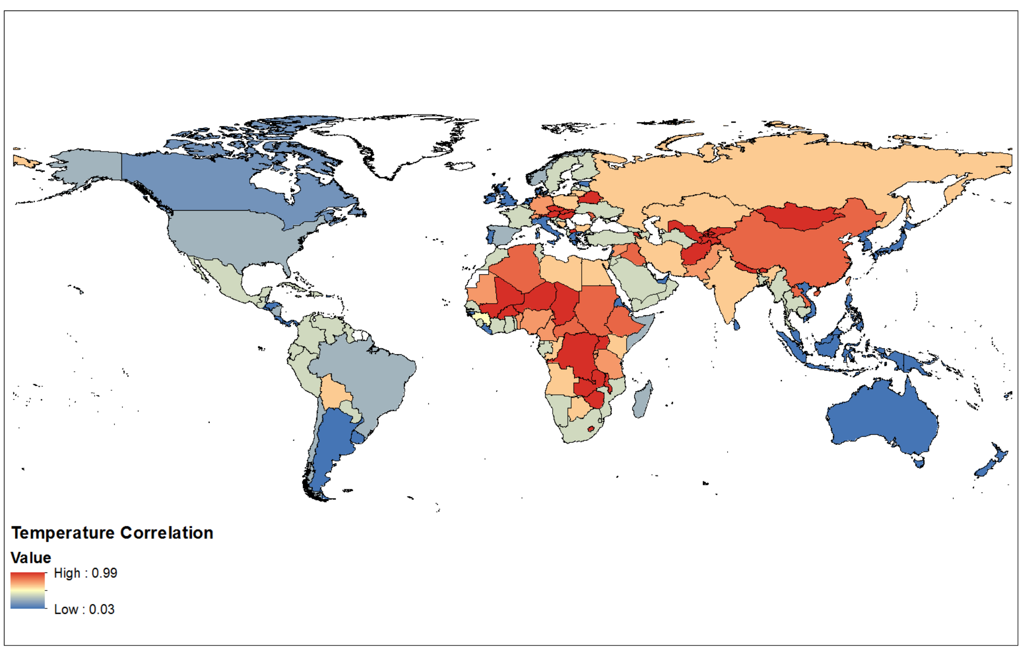


Figure B.3: The Global Distribution of Temperature Spatial Correlation

Table B.1: Determinants of Population Density and Urbanization in the Year 1500

	Population Density					Urbanization
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.543***	-0.538***	-0.691***	-1.012***	-0.908***	-0.854**
	(0.159)	(0.171)	(0.225)	(0.210)	(0.240)	(0.401)
Precipitation (Volatility)	0.215	0.199	0.234	0.292	0.213	0.218
	(0.185)	(0.217)	(0.248)	(0.224)	(0.195)	(0.344)
Temperature (Mean)	-0.235*	-0.214	-0.324	-0.741***	-0.833***	0.228
	(0.138)	(0.191)	(0.212)	(0.220)	(0.226)	(0.448)
Precipitation (Mean)	-0.166	-0.150	-0.175	-0.254	-0.212	-0.157
	(0.171)	(0.178)	(0.187)	(0.155)	(0.138)	(0.375)
Percentage of Arable Land	0.439***	0.435***	0.433***	0.396***	0.277***	0.068
	(0.079)	(0.109)	(0.113)	(0.102)	(0.103)	(0.148)
Absolute Latitude	0.410**	0.428**	0.458*	0.211	0.129	0.531
	(0.188)	(0.191)	(0.263)	(0.242)	(0.220)	(0.461)
Elevation (Mean)		0.013	-0.094	-0.312***	-0.364***	0.177
		(0.077)	(0.083)	(0.084)	(0.079)	(0.278)
Land Suitability (Mean)		0.010	-0.016	-0.012	0.070	-0.018
		(0.129)	(0.133)	(0.123)	(0.119)	(0.200)
Neolithic Transition Timing				0.406***	0.399***	-0.103
				(0.070)	(0.108)	(0.144)
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	Yes	Yes
Adjusted-R^2	0.32	0.31	0.32	0.42	0.44	0.21
Observations	151	151	151	151	151	81

Notes: This table suggests that country-level population density and urbanization in 1500 is adversely affected by the temperature volatility but not by the precipitation volatility. Additional geographical controls are island and landlocked dummy variables and the distance to coast or river. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

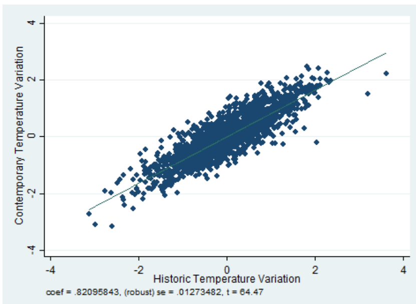
Table B.2: Precipitation Volatility , Spatial Correlation and Job Security Valuation of Second-Generation Migrants

	Preferred Job Characteristic: Security vs. Salary					
	ESS			GSS		
	(1)	(2)	(3)	(4)	(5)	(6)
Precipitation (Volatility)	-0.027		0.008	0.015		0.062
	(0.046)		(0.052)	(0.159)		(0.177)
Precipitation (Spatial Correlation)		0.033	0.040		0.097	0.112
		(0.020)	(0.025)		(0.072)	(0.077)
Country/Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.06	0.06	0.06	0.07	0.07	0.07
Observations	3907	3907	3907	1171	1171	1171

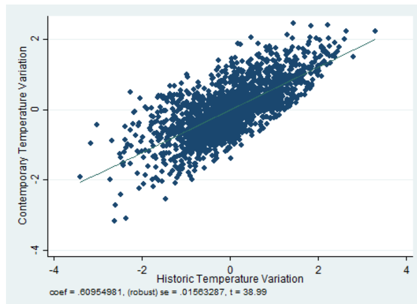
Notes: This table suggests that second generation migrant's valuation of Job Security vs. Salary is neither affected by the temperature volatility (idiosyncratic risk) nor by the temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, education level, religiosity, income and the number of siblings. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

C Climatic Stability Over the Period 700-2000

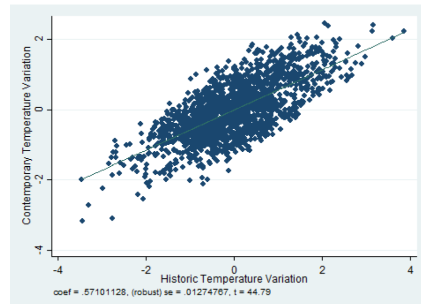
C.1 Temperature Volatility: 1900-2000 Relative to Earlier Centuries



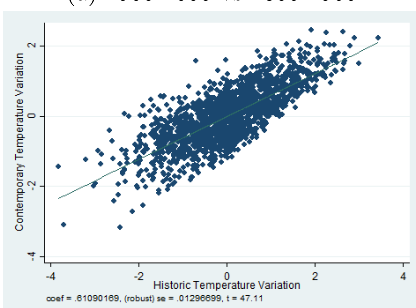
(a) 1900-2000 vs 1800-1900



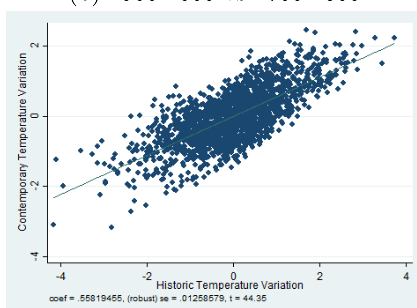
(b) 1900-2000 vs 1700-1800



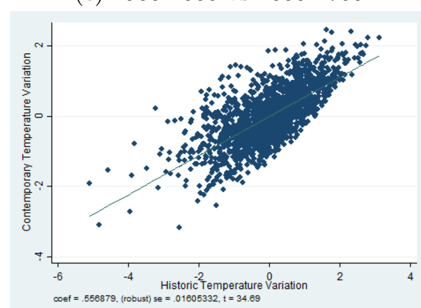
(c) 1900-2000 vs 1600-1700



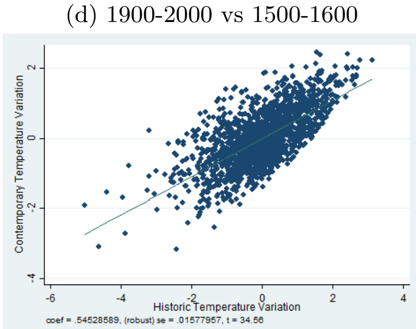
(d) 1900-2000 vs 1500-1600



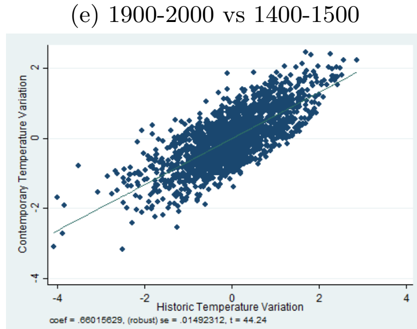
(e) 1900-2000 vs 1400-1500



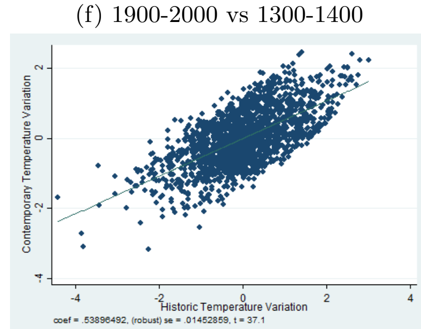
(f) 1900-2000 vs 1300-1400



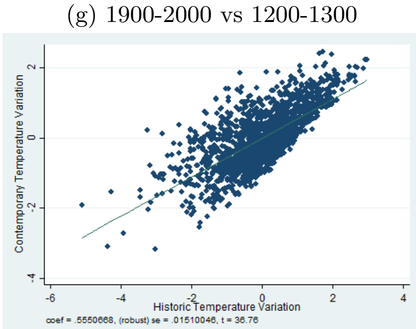
(g) 1900-2000 vs 1200-1300



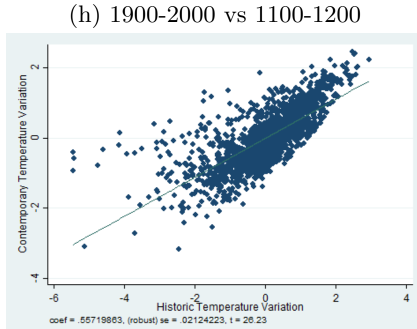
(h) 1900-2000 vs 1100-1200



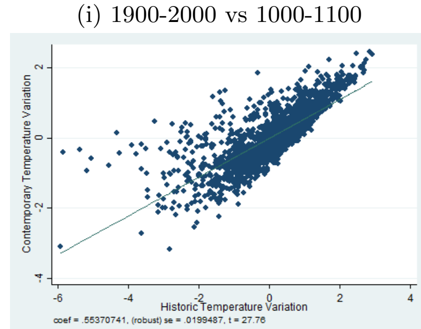
(i) 1900-2000 vs 1000-1100



(j) 1900-2000 vs 900-1000



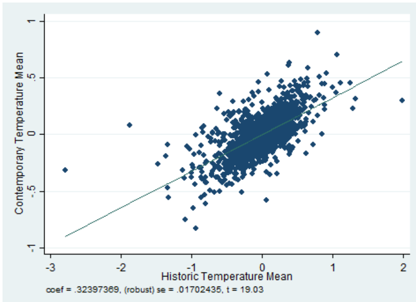
(k) 1900-2000 vs 800-900



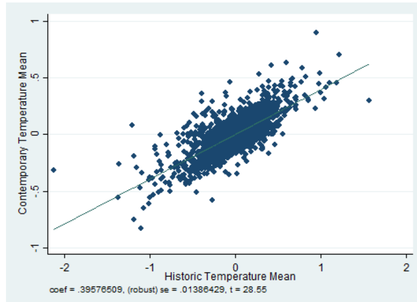
(l) 1900-2000 vs 700-800

Figure C.1: Contemporary vs. Historical Intertemporal Temperature Volatility

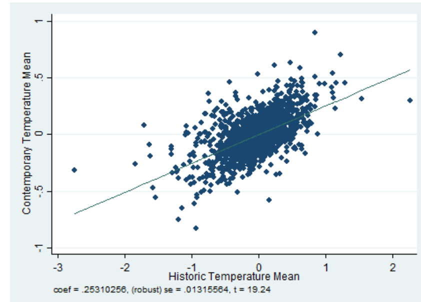
C.2 Mean Temperature: 1900-2000 Relative to Earlier Centuries



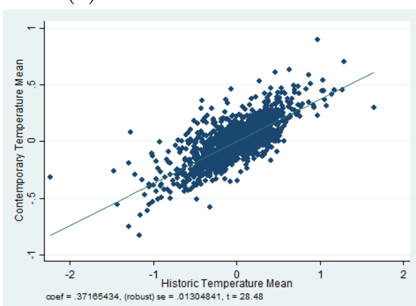
(a) 1900-2000 vs 1800-1900



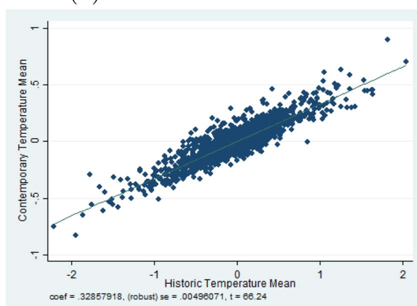
(b) 1900-2000 vs 1700-1800



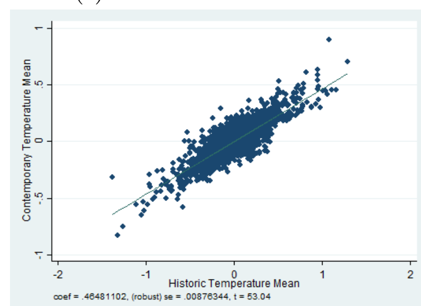
(c) 1900-2000 vs 1600-1700



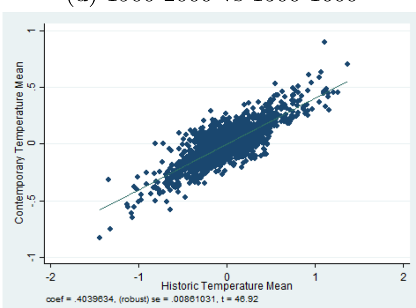
(d) 1900-2000 vs 1500-1600



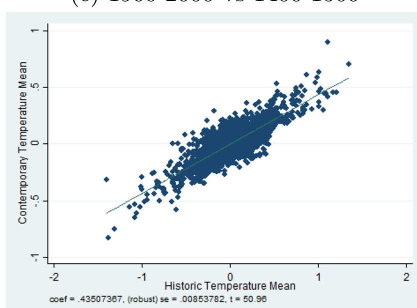
(e) 1900-2000 vs 1400-1500



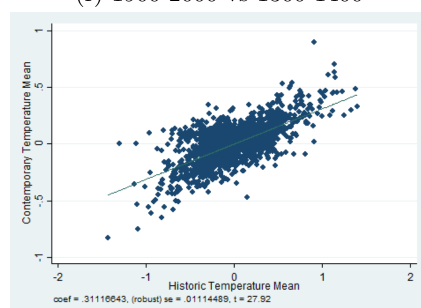
(f) 1900-2000 vs 1300-1400



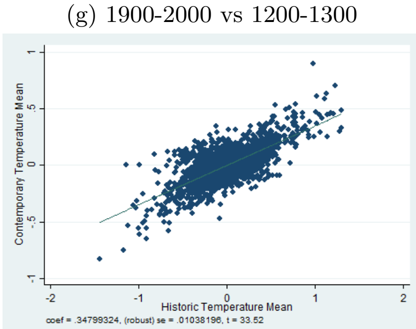
(g) 1900-2000 vs 1200-1300



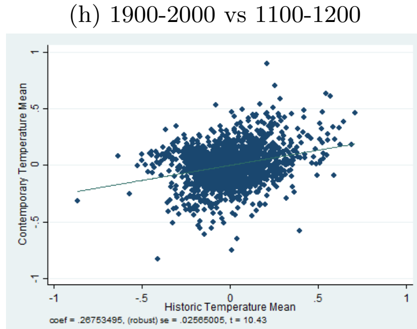
(h) 1900-2000 vs 1100-1200



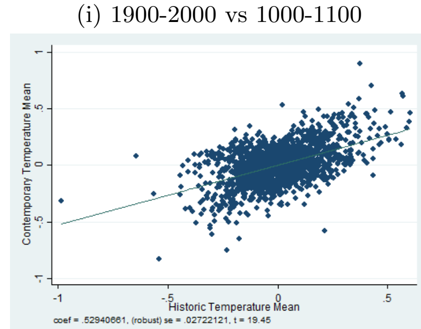
(i) 1900-2000 vs 1000-1100



(j) 1900-2000 vs 900-1000



(k) 1900-2000 vs 800-900



(l) 1900-2000 vs 700-800

Figure C.2: Contemporary vs. Historical Mean Temperature

D Robustness Checks

D.1 ESS and GSS

D.1.1 Alternative Estimation Method: Probit and Ordered Probit

This subsection demonstrates that the results obtained in section 4 are robust to the use of an alternative estimation method, rather than OLS. In particular, using Ordered Probit for the ESS and GSS, one can estimates the probability of observing the ranked preference (in the ESS and GSS), conditional on intertemporal temperature volatility (idiosyncratic risk) as well as on temperature spatial correlation (aggregate uncertainty).

Table D.1: Determinants of Loss Aversion: Second Generation Migrants in Europe (Ordered Probit)

	Preferred job Characteristic: Security vs. Salary					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.194***	-0.279***	-0.284***	-0.292***	-0.298***	-0.286***
	(0.060)	(0.062)	(0.083)	(0.083)	(0.083)	(0.083)
Temperature (Spatial Correlation)	0.043*	0.068**	0.077***	0.074***	0.075***	0.075***
	(0.025)	(0.027)	(0.028)	(0.027)	(0.027)	(0.027)
Temperature (Mean)	-0.172***	-0.125*	-0.116	-0.160	-0.165	-0.095
	(0.055)	(0.066)	(0.122)	(0.125)	(0.122)	(0.125)
Absolute Latitude		0.111***	0.166**	0.134*	0.138*	0.195**
		(0.041)	(0.074)	(0.078)	(0.078)	(0.079)
Elevation (Mean)		-0.008	0.008	-0.003	-0.002	0.009
		(0.021)	(0.028)	(0.031)	(0.031)	(0.031)
Land Suitability (Mean)			0.031	0.017	0.015	0.013
			(0.055)	(0.060)	(0.061)	(0.060)
Neolithic Transition Timing				0.023	0.024	0.012
				(0.021)	(0.021)	(0.021)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes
Round FE	No	No	No	No	Yes	Yes
Individual Controls	No	No	No	No	No	Yes
Pseudo-R^2	0.03	0.03	0.03	0.03	0.03	0.04
Observations	3907	3907	3907	3907	3907	3907

Notes: Using Ordered Probit regressions, this table suggests that the preferred job characteristics of second generation migrants reflect loss aversion. In particular, their valuation of job security vs. salary is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

In line with the predictions of the theory, as well as with the OLS estimates, as documented in Tables D.1 and D.2 larger temperature spatial correlation increases significantly the probability that: (i) second generation migrants in Europe and (ii) second generation migrants in the US will be more loss averse, whereas greater intertemporal temperature volatility decreases the probability that individuals in these distinct samples will be loss averse.

Table D.2: Determinants of Loss Aversion: Second Generation Migrants in the US (Ordered Probit)

	Preferred Job Characteristic						
	Security vs Others					Security vs Salary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Temperature (Volatility)	-0.152*	-0.186**	-0.333***	-0.305***	-0.438***	-0.260***	-0.343***
	(0.088)	(0.080)	(0.065)	(0.066)	(0.062)	(0.073)	(0.083)
Temperature (Spatial Correlation)	0.109**	0.135***	0.144***	0.162***	0.187***	0.137***	0.180***
	(0.048)	(0.052)	(0.049)	(0.058)	(0.048)	(0.047)	(0.052)
Temperature (Mean)	-0.041	-0.015	-0.067	0.023	-0.068	-0.063	0.091
	(0.071)	(0.138)	(0.083)	(0.087)	(0.167)	(0.102)	(0.162)
Absolute Latitude		0.040	0.089	0.143	0.213	0.190	0.318
		(0.119)	(0.133)	(0.135)	(0.223)	(0.144)	(0.203)
Elevation (Mean)		-0.040	-0.123	-0.038	-0.135	-0.086	-0.097
		(0.056)	(0.080)	(0.090)	(0.094)	(0.109)	(0.106)
Land Suitability (Mean)			-0.122	-0.070	-0.153**	-0.097	-0.151*
			(0.079)	(0.083)	(0.070)	(0.096)	(0.091)
Neolithic Transition Timing				-0.101*	-0.083	-0.056	-0.076
				(0.055)	(0.076)	(0.057)	(0.064)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes
Wave FE	No	No	No	No	Yes	No	Yes
Individual Controls	No	No	No	No	Yes	No	Yes
Pseudo-R^2	0.01	0.01	0.01	0.01	0.05	0.02	0.03
Observations	1328	1328	1328	1328	1171	1181	1171

Using Ordered Probit regression, this table suggests that the preferred job characteristics of second generation migrants reflect loss aversion. In particular, their valuation of job security vs other characteristics (salary, short working hours, promotion opportunities and job satisfaction) and of job security vs. salary is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.2 Selection by Unobservables

This subsection examines the likelihood that omitted variables could alter the qualitative findings. Table D.3 suggests that it is very improbable that omitted variables could have affected the qualitative results presented in Tables 1 and 3. In particular, as shown in Column (2) and (4), (using Columns (1) and (3) as the baseline specifications), the estimated value of the coefficient on intertemporal temperature volatility and temperature spatial correlation, if unobservables where as correlated as the observables (i.e., Oster's β^* statistic), are very close to the estimated OLS coefficients. Furthermore, since zero does not belong to the interval created by the estimated value on and Oster's β^*, one can reject the hypothesis that the value of the coefficient is driven exclusively by unobservables. In addition, the indexes AET (Altonji et al., 2005; Bellows and Miguel, 2009) and δ (Oster, 2014) measure how strongly correlated unobservables would have to be in order to account for the full size of the coefficient on temperature volatility and spatial correlation (v and c subscripts correspondingly), are mostly different from the critical value of 1.

Table D.3: Determinants of Loss Aversion: Robustness to Selection on Unobservables

	Loss Aversion							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ESS	ESS	GSS	GSS	WVS	WVS	EA	EA
Temperature (Volatility)	-0.22***	-0.23***	-0.20*	-0.42***	-0.06***	-0.03***	-0.15***	-0.08***
	(0.05)	(0.06)	(0.10)	(0.08)	(0.01)	(0.01)	(0.02)	(0.03)
Temperature (Spatial Correlation)	0.05**	0.06***	0.15**	0.16***	0.01***	0.02***	0.07***	0.05**
	(0.02)	(0.02)	(0.06)	(0.04)	(0.00)	(0.00)	(0.03)	(0.02)
Temperature (Mean)	-0.09*	-0.09	0.02	-0.03	-0.01	0.05***	0.01	-0.02
	(0.05)	(0.09)	(0.17)	(0.21)	(0.01)	(0.01)	(0.02)	(0.02)
Country/Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A
Additional Geographical Controls	No	Yes	No	Yes	No	Yes	No	Yes
Wave/Round FE	No	Yes	No	Yes	No	Yes	N/A	N/A
Individual/Ethnographic Controls	No	Yes	No	Yes	No	Yes	No	Yes
AET_v		-34.61		-1.90		0.98		1.13
δ_v		-5.18		-0.75		1.60		1.36
β_v^*		-0.24		-0.52		-0.01		-0.02
AET_c		-15.36		-16.72		-5.04		2.32
δ_c		-8.27		-27.29		-8.14		2.78
β_c^*		0.06		0.16		0.02		0.03
R^2	0.06	0.08	0.03	0.13	0.02	0.04	0.28	0.49
Adjusted-R^2	0.06	0.07	0.02	0.08	0.02	0.04	0.28	0.47
Observations	3907	3907	1171	1171	130933	130933	471	471

Notes: This table shows the robustness of the results to selection by unobservables. It presents the Altonji et al. (2005) AET ratio as extended by Bellows and Miguel (2009). Additionally, it presents the δ and $\beta^*(1, R^2_{max})$ statistics suggested by Oster (2014), where R^2_{max} is 1.33 of R^2 in the full specification. All statistics suggest that the results are not driven by unobservables. Heteroskedasticity robust standard errors in round parenthesis. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.3 Placebo Test

This section performs a series of placebo tests, analyzing the effect of intertemporal temperature volatility and temperature spatial correlation on the second-generation migrants' valuation of job characteristics that are orthogonal to the loss aversion. Table D.4 suggests that preferences of second-generation migrants in the US for short working hours (Column 1), feeling of importance and accomplishment in a job (Column 2), and promotion opportunities (Column 3) are mostly unaffected by the intertemporal temperature volatility and temperature spatial correlation in the parental country of origin.[36] In addition, the table indicates that the comparative valuations of second-generation migrants in Europe to training opportunities vs ability to use own initiative in a job (Column 4), training opportunities vs salary (Column 5), and salary vs ability to use own initiative (Column 6) are orthogonal to the intertemporal temperature volatility and temperature spatial correlation in the parental country of origin.

D.1.4 Placebo Test for Validation

Table D.5 showcases that the evaluation of the alternative job characteristics are orthogonal to the experimental measures of loss aversion. The alternative job characteristics include: having sufficient time for your personal or

[36] The marginally significant positive effect of temperature volatility on the rank of promotion opportunities in column 3 mechanically captures the negative effect on job security.

Table D.4: Determinants of Loss Aversion of Second Generation Migrants in the US and Europe: Placebo Tests

	GSS			ESS		
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.081	0.126	0.177*	-0.058	0.172	0.130
	(0.123)	(0.101)	(0.090)	(0.096)	(0.115)	(0.102)
Temperature (Spatial Correlation)	-0.077	-0.013	0.053	0.049	-0.035	0.014
	(0.089)	(0.045)	(0.040)	(0.039)	(0.035)	(0.043)
Temperature (Mean)	-0.219	0.052	0.477***	0.092	0.022	0.146
	(0.201)	(0.156)	(0.130)	(0.138)	(0.156)	(0.117)
Absolute Latitude	-0.026	-0.095	0.500**	0.142	-0.168	0.001
	(0.278)	(0.171)	(0.184)	(0.103)	(0.129)	(0.105)
Elevation (Mean)	-0.167	0.206**	0.022	0.031	-0.024	0.013
	(0.102)	(0.077)	(0.061)	(0.038)	(0.041)	(0.035)
Land Suitability (Mean)	-0.198	-0.101	0.340***	0.096*	-0.069	0.031
	(0.137)	(0.113)	(0.059)	(0.054)	(0.080)	(0.068)
Neolithic Transition Timing	0.052	0.052	-0.048	-0.012	0.016	-0.001
	(0.084)	(0.072)	(0.048)	(0.031)	(0.032)	(0.028)
Region/Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Wave/Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.09	0.02	0.07	0.12	0.09	0.22
Observations	1171	1171	1171	2397	2391	2391

Notes: Using OLS regression, this table demonstrates that second generation migrants valuation of job characteristics that are orthogonal to loss aversion (i.e., short working hours in column 1, job satisfaction in 2, promotion opportunities in 3, training opportunities vs ability to use own initiative in 4, training opportunities vs salary in 5 and salary vs ability to use own initiative in 6) is neither affected by temperature volatility (idiosyncratic risk), nor by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

family life (column 1), having good physical working conditions (column 2), having a good working relationship with your direct superior (column 3), working with people who cooperate well with one another (column 4), being consulted by your direct superior in his/her decisions (column 5), having an opportunity for advancement to higher level jobs (column 6), having an element of variety and adventure in the job (column 7).

Table D.5: Alternative Job Characteristics and Measure of Loss Aversion

	Preference for Job Characteristics						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Time	Conditions	Relationship	Collective	Directions	Opportunity	Variety
Average Loss Aversion Estimate	0.09	0.07	0.07	0.02	0.02	0.03	-0.02
	(0.05)	(0.05)	(0.05)	(0.03)	(0.06)	(0.05)	(0.08)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lecture FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Risk Aversion Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.04	0.06	0.05	0.02	0.05	0.07	0.12
Observations	6298	6303	6287	6290	6281	6295	6297

Notes: This table suggests that individual preference for job characteristics other than job security are not associated with individual level of loss aversion as measured by Wang et al. (2016). Individual controls include age, gender, college major and national native dummy variable. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the country-lecture level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.5 Orthogonality to other Cultural Dimensions

This subsection demonstrates that the effects of intertemporal temperature volatility and temperature spatial correlation on Loss Aversion does not capture their effects on a wide range of other cultural characteristics.

In particular, as suggested by Tables D.6 and D.7, intertemporal temperature volatility and temperature spatial correlation in the parental country of origin do not affect long term orientation, obedience, altruism, and attitudes towards equality, gender roles, government and tradition among second-generation migrants in Europe and the US.

In addition, Table D.8 suggests that even though there is a certain degree of statistically significant association between preference for job security over salary and some of the cultural dimensions (e.g., obedience, altruism, equality and preference for strong government) among second generation migrants in Europe, the baseline results are not altered, when accounting for these effects.[37]

Table D.6: Orthogonality of other Cultural Dimensions to Idiosyncratic and Aggregate Uncertainty: Second Generation Migrants in Europe

	Cultural Dimensions						
	(1) LTO	(2) Obedience	(3) Altruism	(4) Equality	(5) Gender	(6) Strong Gov.	(7) Tradition
Temperature (Volatility)	0.776	0.006	0.088	0.047	0.036	0.134	-0.056
	(0.694)	(0.104)	(0.098)	(0.087)	(0.105)	(0.108)	(0.118)
Temperature (Spatial Correlation)	-0.066	0.046	-0.022	0.048	0.040	-0.025	0.012
	(0.137)	(0.032)	(0.027)	(0.033)	(0.034)	(0.036)	(0.031)
Temperature (Mean)	0.142	0.117	0.135	0.025	-0.180	0.119	0.005
	(0.661)	(0.151)	(0.146)	(0.121)	(0.159)	(0.141)	(0.187)
Absolute Latitude	-0.389	0.022	0.069	0.102	-0.139	0.124	0.018
	(0.565)	(0.104)	(0.105)	(0.081)	(0.092)	(0.093)	(0.096)
Elevation (Mean)	-0.408	-0.011	0.016	-0.019	-0.143***	0.038	-0.065*
	(0.263)	(0.035)	(0.029)	(0.029)	(0.041)	(0.031)	(0.037)
Land Suitability (Mean)	0.103	0.018	0.068	-0.005	-0.038	-0.074*	0.103**
	(0.272)	(0.055)	(0.055)	(0.059)	(0.056)	(0.042)	(0.050)
Neolithic Transition Timing	0.206	-0.022	-0.040*	-0.025	0.033	-0.022	-0.106***
	(0.282)	(0.027)	(0.024)	(0.022)	(0.034)	(0.025)	(0.032)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.07	0.13	0.07	0.05	0.15	0.15	0.19
Observations	1416	5695	5718	5704	4401	5693	5712

Notes: Using OLS regression, this table demonstrates that other cultural values of second generation migrants in Europe (i.e., long term orientation, obedience, altruism, attitude towards equality, gender roles, preference for strong government and tradition) are neither affected by temperature volatility (idiosyncratic risk) nor by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

[37] Similar analysis is not possible for the US sample of second generation migrants, due to the small number of respondents for which both the job security preference and other cultural dimensions are observed.

Table D.7: Orthogonality of other Cultural Dimensions to Idiosyncratic and Aggregate Uncertainty: Second Generation Migrants in the US (OLS)

	Cultural Dimensions					
	(1)	(2)	(3)	(4)	(5)	(6)
	LTO	Obedience	Altruism	Equality	Gender	Government
Temperature (Volatility)	0.048	0.173	0.005	0.224	-0.007	-0.028
	(0.029)	(0.120)	(0.081)	(0.140)	(0.022)	(0.050)
Temperature (Spatial Correlation)	-0.028	-0.041	-0.026	-0.147	-0.003	0.009
	(0.017)	(0.047)	(0.022)	(0.094)	(0.009)	(0.035)
Temperature (Mean)	-0.149*	0.470***	-0.027	-0.178	0.027	-0.103
	(0.075)	(0.161)	(0.179)	(0.268)	(0.036)	(0.079)
Absolute Latitude	-0.079	0.397**	0.074	-0.116	0.074	-0.062
	(0.071)	(0.170)	(0.206)	(0.385)	(0.051)	(0.110)
Elevation (Mean)	0.065*	0.326***	0.032	0.031	-0.007	-0.033
	(0.038)	(0.102)	(0.098)	(0.124)	(0.017)	(0.035)
Land Suitability (Mean)	0.012	-0.020	-0.094**	-0.108	0.102***	-0.117**
	(0.029)	(0.134)	(0.046)	(0.175)	(0.017)	(0.048)
Neolithic Transition Timing	0.008	-0.238***	0.042	0.077	-0.040***	0.068**
	(0.029)	(0.080)	(0.101)	(0.087)	(0.014)	(0.028)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.08	0.15	0.02	0.06	0.11	0.04
Observations	1269	1285	1287	1841	1444	2181

Notes: Using OLS regression, this table suggests that other cultural values of second generation migrants in the US (i.e., long term orientation, obedience, altruism, attitude towards equality and gender roles, and confidence in government) are neither affected by temperature volatility (idiosyncratic risk) nor by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, education level, religion, income and the number of siblings. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

Table D.8: Robustness of the effect of Idiosyncratic and Aggregate Uncertainty on Preference for Job Security other Salary to other Cultural Dimensions: Second Generation Migrants in Europe

Preference for Job Security vs Salary	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.228***	-0.230***	-0.243***	-0.229***	-0.229***	-0.226***
	(0.069)	(0.068)	(0.068)	(0.062)	(0.068)	(0.067)
Temperature (Spatial Correlation)	0.062***	0.062***	0.064***	0.057***	0.064***	0.060***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Obedience	0.023*					
	(0.012)					
Altruism		0.032**				
		(0.015)				
Equality			0.030**			
			(0.014)			
Gender				-0.002		
				(0.010)		
Strong Gov.					0.034***	
					(0.013)	
Tradition						0.019
						(0.011)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.07	0.07	0.07	0.07	0.07	0.06
Observations	3788	3798	3788	3867	3777	3793

Notes: Using OLS regression, this table demonstrates that second generation migrants preference for job security other salary is positively and statistically associated with some of the other preference (i.e., obedience, altruism, attitude towards equality and preference for strong government) but is orthogonal to others (i.e., attitudes towards gender roles and tradition). In any of the cases the effect of temperature volatility (idiosyncratic risk) and temperature spatial correlation (aggregate uncertainty) in the parental country of origin on the valuation of job security other salary is significantly affected. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.6 Historical Temperature Volatility: Evidence from ESS

This subsection examines the effect of the historical temperature volatility on the level of loss aversion of second-generation migrants in Europe, as captured by their preference for job security. As shown in Table D.9, the valuation of job security among second generation migrants in Europe is positively associated with temperature spatial correlation as before, and is negatively affected by the inter-temporal temperature volatility calculated for longer time horizon. In particular, columns (1) through (3) document that the degree of loss aversion of second generation migrants in Europe is negatively affected by the intertemporal temperature volatility between the years 500 CE and 2000 CE. In addition, columns (4) through (6) imply negative and significant association between second-generation migrant's preference for job security and measure of idiosyncratic climatic volatility, which captures variation in temperature in the past, between the years 500 CE and 1000 CE.

Table D.9: Determinants of Loss Aversion: Historical Volatility (ESS)

	Preferred Job Characteristic: Security vs. Salary					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility) 500-2000	-0.067*	-0.067**	-0.069**			
	(0.034)	(0.034)	(0.033)			
Temperature (Volatility) 500-1000				-0.052***	-0.051***	-0.048**
				(0.019)	(0.019)	(0.019)
Temperature (Spatial Correlation)	0.038*	0.039*	0.039*	0.069**	0.070**	0.074**
	(0.022)	(0.022)	(0.022)	(0.027)	(0.027)	(0.029)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	No	Yes	Yes	No	Yes	Yes
Individual Controls	No	No	Yes	No	No	Yes
Adjusted-R^2	0.05	0.05	0.06	0.06	0.06	0.07
Observations	3905	3905	3905	3691	3691	3691

Notes: Using OLS regressions, this table suggests that the valuation of job security vs. salary among the second generation migrants in Europe is negatively affected by historical temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are the gini index of land suitability, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.7 The Insignificant Role of Preindustrial Development

This subsection suggests that the effect of the climatic variables on loss aversion is orthogonal to the potentially confounding effect of historical levels of population density, urbanization and income per capita density. In particular, Table D.10 demonstrates that, accounting for population density in 1500, urbanization in 1800, and GDP per capita in 1913, the effects of intertemporal climatic volatility and temperature spatial correlation on loss aversion in the ESS (columns (1)-(3)), GSS (columns (4)-(6)), and WVS (columns(7)-(9)) remain stable and mostly highly significant and qualitatively similar.

Table D.10: Temperature Volatility, Spatial Correlation and Loss Aversion:
Accounting for the Persistence of Preindustrial Development

	Temperature Volatility, Spatial Correlation and Loss Aversion								
	ESS			GSS			WVS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Temperature (Volatility)	-0.21***	-0.23***	-0.23**	-0.82***	-0.80***	-0.60***	-0.03***	-0.04***	-0.03***
	(0.06)	(0.06)	(0.09)	(0.21)	(0.20)	(0.18)	(0.01)	(0.01)	(0.01)
Temperature (Spatial Correlation)	0.05**	0.06**	0.08***	0.36***	0.39**	0.34***	0.02***	0.02***	0.02***
	(0.02)	(0.02)	(0.02)	(0.13)	(0.15)	(0.10)	(0.00)	(0.00)	(0.01)
Population Density (1500)	0.00			-0.00			0.00		
	(0.00)			(0.01)			(0.00)		
Urbanization Rate (1800)		0.15			0.48			-0.09**	
		(0.17)			(0.93)			(0.04)	
Income percapita (1913)			0.03			0.21			-0.03***
			(0.04)			(0.14)			(0.01)
Country/Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Wave/Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.08	0.08	0.08	0.12	0.12	0.12	0.04	0.04	0.05
Adjusted-R^2	0.07	0.07	0.06	0.07	0.07	0.07	0.04	0.04	0.05
Observations	3907	3864	3061	1171	1171	1117	130933	125078	83350

Notes: This table shows the robustness of the results to the level of historical development as captured by the population density in year 1500 CE, urbanization rate in 1800 CE and GDP per capita in 1913 CE . Heteroskedasticity robust standard errors in round parenthesis. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.8 Robustness to the Density of Weather Stations

In light of the potential association between the density of weather stations and measurements of temperature spatial correlation in a given region, one may be concerned about the possibility that climatic conditions affected the loss aversion via non-evolutionary channels. In particular, variation in temperature spatial correlation can be partially driven by the differences in the density of the weather measuring stations, which, in turn, is affected by the contemporary economic and institutional characteristics of a country, which may have direct effect on the observed rate of loss aversion.

To address this problem base-line results are replicated taking into account the potential confounding effect of the weather measuring stations' density. In particular, columns (1) and (2) of Table D.11 replicate columns (5) and (6) of Table 1, while controlling for the density of the weather stations, used to measure the climatic data at hand. Columns (3)-(6) replicate the same exercise for columns (4)-(7) of Table 3. It is established that the observed level of loss aversion among second generation migrants in Europe and the US is not directly affected by the density of weather measuring stations, while the effect of temperature volatility and spatial correlation remains statistically significant and quantitatively similar to the base-line results.

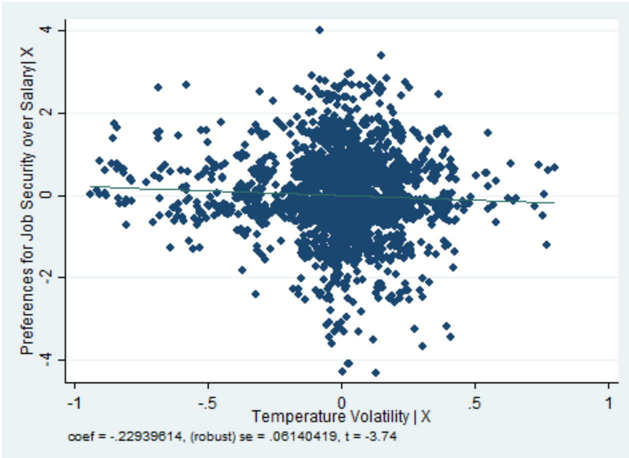
Table D.11: Determinants of Loss Aversion: Robustness to the Density of Weather Stations

	ESS		GSS			
	Security v Salary		Job Security		Security v Salary	
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.264***	-0.260***	-0.321***	-0.461***	-0.404***	-0.513***
	(0.066)	(0.065)	(0.083)	(0.070)	(0.135)	(0.156)
Temperature (Spatial Correlation)	0.075***	0.074***	0.175**	0.194***	0.232***	0.240***
	(0.023)	(0.023)	(0.069)	(0.042)	(0.067)	(0.062)
Temperature (Mean)	-0.171**	-0.132	0.041	-0.019	-0.155	-0.298
	(0.077)	(0.080)	(0.107)	(0.151)	(0.175)	(0.264)
Density of Weather Stations	0.008	0.006	0.069	0.044	0.099	0.012
	(0.015)	(0.015)	(0.048)	(0.054)	(0.086)	(0.108)
Absolute Latitude	0.072	0.107	0.207	0.185	0.255	0.092
	(0.078)	(0.080)	(0.221)	(0.201)	(0.331)	(0.372)
Elevation (Mean)	-0.027	-0.026	0.003	-0.155*	-0.148	-0.295*
	(0.022)	(0.022)	(0.106)	(0.082)	(0.177)	(0.167)
Land Suitability (Mean)	0.026	0.023	-0.085	-0.152*	-0.095	-0.192
	(0.050)	(0.050)	(0.099)	(0.078)	(0.150)	(0.164)
Neolithic Transition Timing	0.018	0.012	-0.152*	-0.073	-0.106	-0.046
	(0.015)	(0.015)	(0.079)	(0.063)	(0.105)	(0.094)
Country/Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round/Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	No	Yes	No	Yes	No	Yes
Adjusted-R^2	0.06	0.07	0.02	0.09	0.04	0.07
Observations	3907	3907	1166	1166	1166	1166

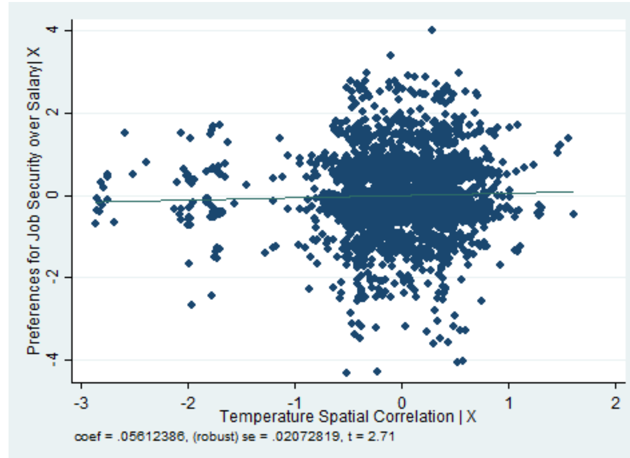
Notes: This table suggests that second generation migrant's valuation of Job Security vs. Salary is negatively affected by the temperature volatility (idiosyncratic risk) and positively affected by the temperature spatial correlation (aggregate uncertainty), while being unaffected by the density of the weather stations in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, education level, religiosity, income and the number of siblings. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.9 Insignificant outliers

This subsection examines the potential importance of outliers in the established relationship between intertemporal temperature volatility and temperature spatial correlation and the emergence of loss aversion. As depicted in Figures D.1 and D.2 outliers do not appear to govern the observed relationship in the ESS and the GSS. In particular, as established in Table D.12 the results remain qualitatively intact if individuals from the Netherlands, that constitute the isolated observation, that may affect the significance of the association are removed the in Figure D.2, are excluded from the sample.

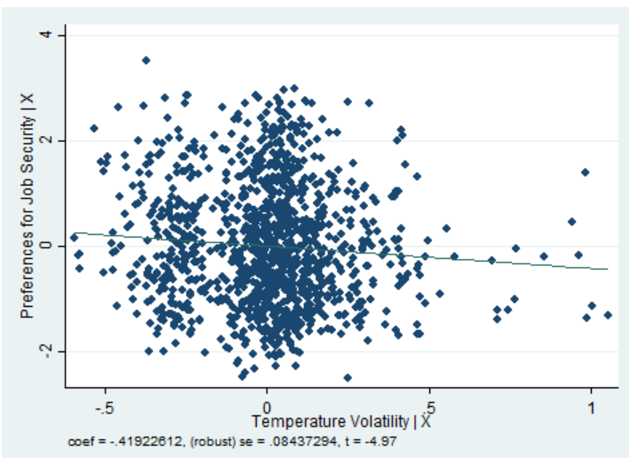


(a) Effect of Temperature Volatility

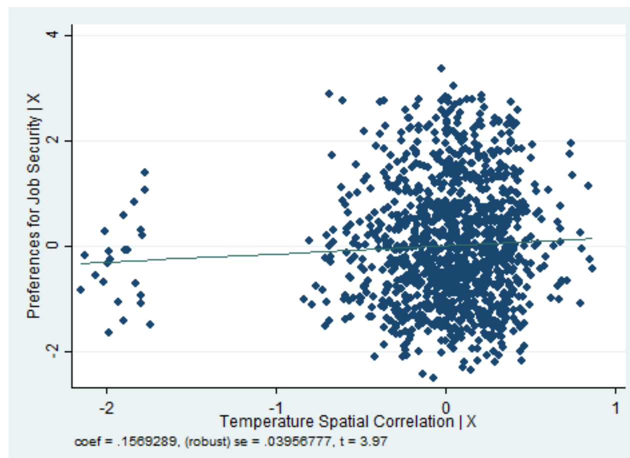


(b) Effect of Temperature Spatial Correlation

Figure D.1: Temperature Shocks Characteristics and Preferences for Job Security in Europe (Binned)

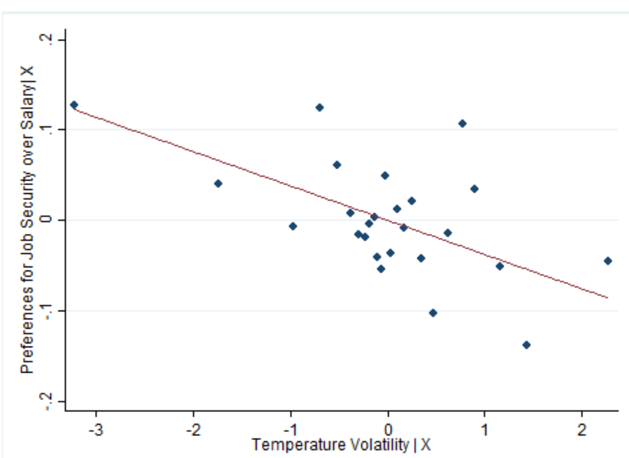


(a) Effect of Temperature Volatility

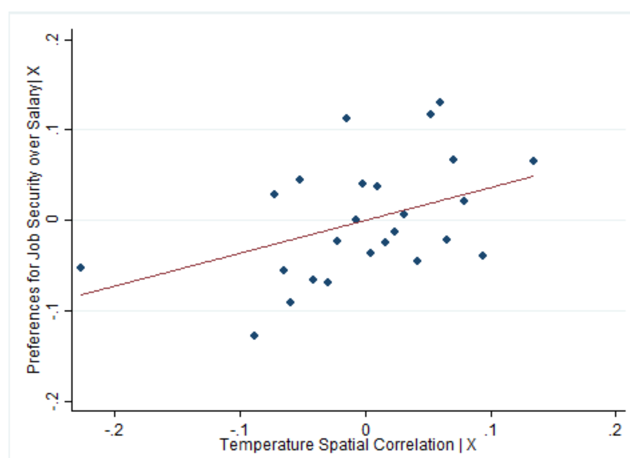


(b) Effect of Temperature Spatial Correlation

Figure D.2: Temperature Shocks Characteristics and Preferences for Job Security in the US (Binned)

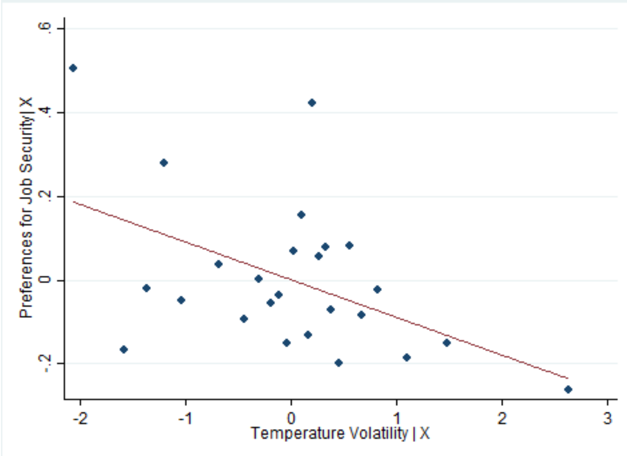


(a) Effect of Temperature Volatility

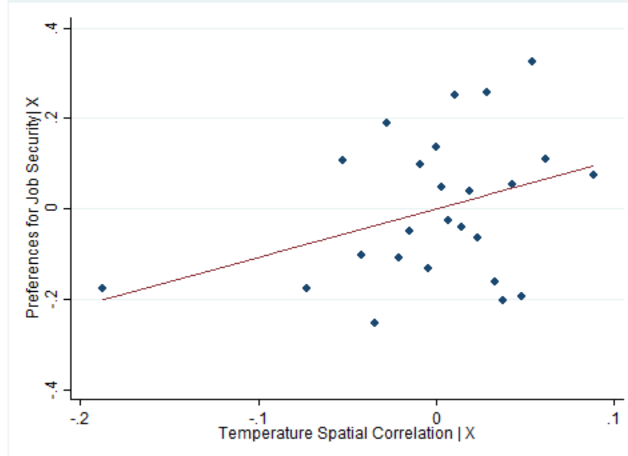


(b) Effect of Temperature Spatial Correlation

Figure D.3: Temperature Shocks Characteristics and Preferences for Job Security in Europe



(a) Effect of Temperature Volatility



(b) Effect of Temperature Spatial Correlation

Figure D.4: Temperature Shocks Characteristics and Preferences for Job Security in the US

Table D.12: Determinants of Loss Aversion: Second Generation Migrants in the US: Excluding Potential Outliers - the Netherlands

	Preferred Job Characteristic					
	Security vs Others			Security vs Salary		
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.34***	-0.35***	-0.36***	-0.56***	-0.57***	-0.67***
	(0.08)	(0.08)	(0.11)	(0.17)	(0.17)	(0.17)
Temperature (Spatial Correlation)	0.31***	0.31***	0.21*	0.47***	0.47***	0.40**
	(0.07)	(0.06)	(0.11)	(0.13)	(0.13)	(0.17)
Temperature (Mean)	0.13	0.15	0.06	0.38	0.42	0.40
	(0.16)	(0.16)	(0.23)	(0.31)	(0.31)	(0.33)
Absolute Latitude	0.19	0.24	0.19	0.71*	0.77**	0.77**
	(0.19)	(0.19)	(0.26)	(0.35)	(0.33)	(0.35)
Elevation (Mean)	0.11	0.13	0.08	0.28*	0.29*	0.15
	(0.09)	(0.09)	(0.12)	(0.16)	(0.16)	(0.18)
Land Suitability (Mean)	0.14*	0.13	0.03	0.12	0.11	-0.08
	(0.07)	(0.08)	(0.11)	(0.20)	(0.20)	(0.20)
Neolithic Transition Timing	-0.19***	-0.20**	-0.16	-0.30**	-0.30**	-0.21
	(0.07)	(0.07)	(0.09)	(0.11)	(0.11)	(0.13)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Wave FE	No	Yes	Yes	No	Yes	Yes
Individual Controls	No	No	Yes	No	No	Yes
Adjusted-R^2	0.01	0.01	0.09	0.01	0.01	0.07
Observations	1373	1373	1217	1300	1300	1148

Notes: Using OLS regression, this table suggests that the preferred job characteristics of second generation migrants reflect loss aversion. In particular, their valuation of job security vs all other characteristics (salary, short working hours, promotion opportunities and job satisfaction) and of job security vs. salary is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, number of siblings, religion, education level, and income. Sample does not include the Netherlands in all columns, in columns (4) – (6) small island countries are also excluded. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.1.10 Univariate Regressions

In light of the predictions of the theory, in all empirical specifications the degree of loss aversion is determined jointly by temperature volatility and spatial correlation. The theoretical predictions regarding the individual effect of each climatic characteristic are made holding the other one constant (i.e., partial effect) and thus the empirical analysis simultaneously studies both effects.

The theory allows to gain additional insights about the unconditional effect of each climatic characteristic. In particular, theoretical prediction regarding temperature volatility is independent of the shocks aggregate component (i.e., spatial correlation) as depicted in Figure 6. Panels (a) and (b) demonstrate quantitatively similar effect of temperature volatility on the average loss neutrality of population under different levels of shocks correlation. Thus, the theory predicts a negative unconditional effect of temperature volatility on loss aversion.

Theoretical prediction with respect to the temperature spatial correlation, on the other hand, is ambiguous when analyzed unconditionally (i.e., independently from the volatility dimension). For instance, as the climatic volatility is approaching zero, the aggregate vs idiosyncratic nature of the shock becomes less important and the effect of spatial correlation is reduced. Hence, the theoretical prediction regarding the magnitude of the positive effect of temperature spatial correlation on loss aversion is valid as long as the volatility is held constant and this effect in the univariate regression can be insignificant.

These predictions are in fact consistent with the empirical analysis. In particular, Table D.13 reports individual univariate and simultaneous effects of temperature volatility and spatial correlation on preference for job security as captured by ESS, GSS and WVS. Consistent with the theory, effect of climatic volatility is negative and significant in all of the samples both univariatly and controlling for the other climatic dimension. The effect of spatial correlation, although positive throughout, is significant univariatly only in one out of three samples, but is always highly significant when accounting for the confounding effect of volatility. The correlation between these two variables in the sample is about 0.25.

Table D.13: Determinants of Loss Aversion: Univariate Regressions

	Preferred Job Characteristic: Security vs. Salary								
	ESS			GSS			WVS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Temperature (Volatility)	-0.050***		-0.081***	-0.087**		-0.186***	-0.067***		-0.087***
	(0.017)		(0.019)	(0.043)		(0.053)	(0.003)		(0.003)
Temperature (Spatial Correlation)		0.108	0.371***		0.063	0.233***		0.046***	0.088***
		(0.100)	(0.111)		(0.062)	(0.076)		(0.004)	(0.004)
Observations	3907	3907	3907	1328	1328	1328	142057	142057	142057

Notes: This table suggests that second generation migrant's and individual's valuation of Job Security vs. Salary is negatively affected by the temperature volatility (idiosyncratic risk) and positively affected by the temperature spatial correlation (aggregate uncertainty) in the parental country of origin. No additional covariates are included. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.2 Robustness of Results based on WVS

D.2.1 Alternative Estimation Method: Probit

The results are robust to the use of an alternative estimation method, rather than OLS. In particular, using Probit, one can estimates the probability of observing preference for Job Security vs other job characteristics, conditional on intertemporal temperature volatility (idiosyncratic risk) as well as on temperature spatial correlation (aggregate uncertainty). In line with the OLS estimates, as established in Tables 8, larger temperature spatial correlation increases significantly the probability that second generation migrants in Europe, as well as in the US, will be more loss averse, whereas greater intertemporal temperature volatility decreases the probability that a second generation migrants in Europe and the US will be loss averse.

Table D.14: Determinants of Loss Aversion: Individuals in the WVS (Probit)

	Preferred Job Characteristic: Security vs Others						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Temperature (Volatility)	-0.062***	-0.066***	-0.047***	-0.030***	-0.030***	-0.030***	
	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)	
Temperature (Spatial Correlation)	0.013***	0.014***	0.016***	0.021***	0.019***	0.016***	
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	
Temperature (Volatility, Ancestral)							-0.023***
							(0.007)
Temp (Spatial Correlation, Ancestral)							0.010**
							(0.004)
Temperature (Mean)	-0.017***	-0.008	0.009	0.044***	0.050***	0.047***	0.046***
	(0.005)	(0.007)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
Absolute Latitude		0.014**	0.009	0.040***	0.072***	0.065***	0.056***
		(0.007)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)
Elevation (Mean)	-0.023***	-0.021***	0.014***	0.025***	0.014***	0.010**	0.008*
	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Land Suitability (Mean)			0.026***	0.039***	0.015***	0.015***	0.014***
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Neolithic Transition Timing					0.062***	0.059***	0.056***
					(0.005)	(0.005)	(0.005)
Region of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes	Yes
Individual Controls	No	No	No	No	No	Yes	Yes
Pseudo-R^2	0.01	0.01	0.02	0.03	0.03	0.03	0.03
Observations	130933	130933	130933	130933	130933	130933	130933

Notes: Using Probit regression, this table suggests that individuals' valuation of job security vs other job characteristics (i.e., salary, colleagues, job satisfaction) is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the country of birth. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, religion, education level, and income. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. All coefficients represent average marginal effects, and since all independent variables have been normalized by subtracting their mean and dividing by their standard deviation, all coefficients are comparable. Heteroskedasticity robust clustered standard error estimates are reported in parentheses; clustering at the region of interview and individual characteristics level; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

D.2.2 Selection on Unobservables

This subsection examines the likelihood that omitted variables could alter the qualitative findings. Table D.3 suggests that it is very improbable that omitted variables could have affected the qualitative results presented in Tables 1 and 3. In particular, as established in Column (6), (using Columns (5) as the baseline specifications), the estimated value of the coefficient on intertemporal temperature volatility and temperature spatial correlation, if unobservables where as correlated as the observables (i.e., Oster's β^* statistic), are very close to the estimated OLS coefficients. Furthermore, since zero does not belong to the interval created by the estimated value on and Oster's β^*, one can reject the hypothesis that the value of the coefficient is driven exclusively by unobservables. In addition, the indexes AET (Altonji et al., 2005; Bellows and Miguel, 2009) and δ (Oster, 2014) measure how strongly correlated unobservables would have to be in order to account for the full size of the coefficient on temperature volatility and spatial correlation (v and c subscripts correspondingly), are mostly different from the critical value of 1.

D.2.3 The Insignificant Role of Preindustrial Development

In light of the adverse effect of climatic volatility on preindustrial development, as capture by urbanization and population density in the year 1500 (Table D.10), one may be concerned about the possibility that climatic conditions affected the loss aversion via non-evolutionary channels. In particular, preindustrial development and its potential effect on contemporary economic, institutional and cultural characteristics may have directly affected the observed rate loss aversion rather than via the proposed evolutionary channel.

The chosen empirical framework, however, mitigates these concerns since the analysis is based on individual level data, accounting in particular, for income and education. Moreover, as reported in columns (7)-(9) of Table D.10, the effect of the climatic variables on loss aversion is orthogonal to the potentially confounding effect of historical levels of population density in 1500, urbanization in 1800, and GDP per capita in 1913.[38]

[38] 1913 is the earliest date for which data on GDP per capita is available for a considerable number of countries.

E The Columbian Exchange

This section exploits the "random assignment" of volatility in the course of the Columbian Exchange to identify the impact of climatic volatility on the evolution of loss aversion, addressing potential concerns that sorting of loss averse individuals into the less volatile environments governs the observed association between volatility and loss aversion. The findings suggest that sorting played an insignificant role in the determination of loss aversion in the post-1500 period.

The potential adoption of dominating crops in the course of the Columbian Exchange, had changed the effective volatility since different crops have different growth cycles. Hence, this quasi natural experiment generated exogenous variation in the change of effective crop-specific temperature volatility in each region, permitting the identification of the impact of volatility on loss aversion.

Climatic volatility has implications for the well-being of a farmer over the entire year and not only in the growing period. In particular, volatility:

- adversely affects the viability of seeds during the planting season;
- diminishes the crops growth potential during the growth period;
- may damage the crops during the harvest period;
- adversely affect the ability to safely store crops and seed during the non-growing period;
- adversely affects the availability of other food sources during the non-growing season.

As established in the baseline regressions, volatility over the year as a whole is significantly associated with loss aversion. In fact, consistent with the view that each season during the year matters for the choice of the risky mode of production, and therefore for the evolution of loss aversion, volatility during the growing season and the non-growing seasons are both associated with the level of loss aversion (Table E.1), although the volatility during the growing period is more important.

As such, the Columbian Exchange, and its impact on the change in volatility in either the growing or the non-growing period, can serve as a random assignment of volatility. This identification strategy simply requires that the Columbian exchange will generate significant variations in the changes in volatility across the globe, in any of these sub period.

The evidence suggests that the variation generated due to changes in the non-growing season (i.e., the fourth quarter) are most pronounced and they are therefore used in the baseline statistical model. Despite the fact that volatility is less damaging in the fourth quarter than in the first one, the change in volatility generate more variations across the globe during this period and therefore is more effective in the use of this identification strategy.

The results however are robust to the use of different time intervals, including those that include an overlap between the growing and the non-growing period (Table E.2), where months 1-3 are (typically) the entire growing period and 10-12 the three months prior to planting. Note that, if we consider the year as a whole, the change in volatility will be zero in all regions and no variations in volatility will be generated. Hence, in order to generate changes of volatility due to the Columbian exchange we have to restrict ourselves for a 3-6 month interval.

Reassuringly, using this method, the overall effect of volatility on loss aversion is nearly equal to the sum of the effect in the pre-1500 period and the change in the post 1500 period, lending further credence to the method used.

Table E.1: Determinants of Loss Aversion: Volatility over the Growth Cycle

	Preferred Job Characteristic: Security vs. Salary					
	(1)	(2)	(3)	(4)	(5)	(6)
Effective Temperature Volatility (Productive Period)	-0.144***					
	(0.050)					
Effective Temperature Volatility (Unproductive Period)		-0.074**				
		(0.036)				
Effective Temperature Volatility (1st Quarter of Growth Cycle)			-0.126***			
			(0.047)			
Effective Temperature Volatility (2nd Quarter of Growth Cycle)				-0.092*		
				(0.052)		
Effective Temperature Volatility (3rd Quarter of Growth Cycle)					-0.048	
					(0.032)	
Effective Temperature Volatility (4th Quarter of Growth Cycle)						-0.071**
						(0.034)
Temperature Spatial Correlation	0.068**	0.089***	0.060**	0.055*	0.075**	0.087***
	(0.028)	(0.032)	(0.028)	(0.028)	(0.030)	(0.032)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.06	0.06	0.06	0.06	0.06	0.06
Observations	3859	3859	3859	3859	3859	3859

Notes: This table suggests that second generation migrant's valuation of Job Security vs. Salary is negatively affected by the effective temperature volatility (idiosyncratic risk) during the different stages of the crop growth cycle, except for the 3rd quarter, and positively affected by the temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, education level, religiosity, income and the number of siblings. Sample excludes small island countries. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Month 1 stands for the first month since the beginning of the optimal growth cycle, while month 12 is the last one. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

Table E.2: Determinants of Loss Aversion: Random Assignment of Volatility

	Preferred Job Characteristic: Security vs. Salary					
	(1)	(2)	(3)	(4)	(5)	(6)
Effective Temperature (Volatility) post 1500	-0.068**					
(months 11 – 2)	(0.032)					
Effective Temperature (Volatility) pre 1500		-0.051*	-0.098**			
(months 11 – 2)		(0.028)	(0.038)			
Effective Temperature (Volatility) change			-0.119**			
(months 11 – 2)			(0.057)			
Effective Temperature (Volatility) post 1500				-0.065**		
(months 10 – 3)				(0.031)		
Effective Temperature (Volatility) pre 1500					-0.054*	-0.076**
(months 10 – 3)					(0.029)	(0.038)
Effective Temperature (Volatility) change						-0.117**
(months 10 – 3)						(0.056)
Temperature (Spatial Correlation)	0.090***	0.083**	0.090***	0.088**	0.085***	0.087**
	(0.032)	(0.032)	(0.032)	(0.034)	(0.032)	(0.034)
Country of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Round FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.06	0.06	0.06	0.06	0.06	0.06
Observations	3859	3859	3859	3859	3859	3859

Notes: This table establishes that second generation migrant's valuation of Job Security vs. Salary is negatively affected by the effective temperature volatility (idiosyncratic risk) prior and after the Columbian Exchange and positively affected by the temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability gini, distance to coast or river, landlocked dummy, percentage of land in the tropical, subtropical and temperate zones and precipitation level. Individual controls include age, gender, education level, religiosity, income and the number of siblings. Sample excludes small island countries. Months 1-3 are the growing period whereas 10-12 are the months before the onset of the growing period. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Month 1 stands for the first month since the beginning of the optimal growth cycle, while month 12 is the last one. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

F Ethnic Group Level Analysis

F.1 Proxy Measures of Loss Aversion

Proxies for the rate of loss aversion at an ethnic group level are constructed using several ethnographic characteristics, which arguably capture revealed preference for cautiousness and are associated with loss averse behavior. Differences in the prevalence and the distribution of loss aversion across ethnic groups are captured by two ethnographic characteristics reported by the EA and the SCCS. In particular, loss aversion is captured by parental preferences for sleeping in closed proximity to their infants; an overly cautious behavior driven by the fear of losing a child during his sleep, despite the low probability associated with this event, that may resemble the "endowment effect" in prospect theory. Alternatively, loss aversion is captured by the prevailing types of games played by members of an ethnic group. In particular, loss-aversion among members of the ethnic group, is captured by the prevalence of games that are predominantly strategy-based, rather than those governed by chance. The presence of a chance as the major element in games is associated with a lower rate of cautiousness and thus loss neutral population, while strategy based games would be more common among groups with more cautious and loss averse population, who are willing to invest in order to reduce the likelihood of a loss. The endowment in this case reflect the reputation of the individual and the disproportionate weight assigned to loss in reputation as opposed to a gain in it.

In addition, the degree of diversification across productive activities is used to capture manifestation of loss aversion in human behavior. Prevalence of high diversification of activities, as a strategy of mitigating effects of adverse shocks, is a consequence of a higher degree of loss aversion among the members of the ethnic group. Alternatively, loss aversion could manifest itself through the choice of a major crop for cultivation. In particular, the choice of roots or tubers, as opposed to cereals, would be an indicator of a higher degree of loss aversion on an ethnic level, due to the greater relative resistance of roots and tubers to the adverse effects of climatic shocks.

F.2 Determinants of Loss Aversion

This section analyzes the determinants of loss aversion across ethnic groups. Variations in the prevalence and the distribution of loss-aversion across ethnic groups are captured by a variety of newly introduced measures of the intensity of loss aversion and loss averse behavior. In particular, it analyzes the effect of intertemporal temperature volatility and temperature spatial correlation on the degree of cautiousness, as captured by the types of games played in an ethnic group as reported by the Ethnographic Atlas (EA) and the sleeping proximity of parents to infant as reported by the (SCCS). The analysis also focuses on the effect of intertemporal temperature volatility and temperature spatial correlation on the manifestations of loss aversion in the observed behavior, reflected by the diversification of activities across subsistence modes and the choice of crop, as documented by the EA. The effect of climatic characteristics on the proxies of loss aversion on an ethnic group level is estimated by an Ordinary

Least Squares (OLS) methodology using the following model

$$LA_{er} = \beta_0 + \beta_1^{vol} temp_e^{vol} + \beta_1^{corr} temp_e^{corr} + \sum_j \gamma_{0j} X_{ej} + \sum_j \gamma_{1j} E_{ej} + \sum_r \gamma_r \delta_r + \epsilon_e \tag{76}$$

where LA_{er} is the preference for loss aversion or measure of loss averse behavior in ethnic group e in region r, $temp_e^{vol}$ and $temp_e^{corr}$ are measured on the level of the ethnic group e, X_{ej} is geographical characteristic j (absolute latitude, mean elevation, mean temperature, mean land suitability and its standard deviation, distance to coast or river and precipitation level), measured on the ethnic level of group e, E_{ej} is ethnographic characteristic j of group e (intensity of agriculture and animal husbandry, settlement structure and plow use), δ_r is a set of regional fixed effects for Americas, Old World and Africa, and ϵ_e is the error term. The theory predicts negative effect of temperature volatility and positive effect of temperature spatial correlation (i.e., $\beta_1^{vol} < 0$ and $\beta_1^{corr} > 0$).

F.2.1 Preference for Cautiousness

This section suggests that, in line with the predictions of the theory, the degree of cautiousness, as captured by the types of games played in an ethnic group and the sleeping proximity of parents to infant is negatively and significantly affected by the degree of intertemporal temperature volatility and positively affected by the spatial correlation of temperature shocks.

Table F.1 documents a negative statistically and economically significant effect of temperature volatility and positive significant effect of temperature spatial correlation on preference for cautiousness at the ethnic group level. The result, based on the EA, is robust to the inclusion of ethnographic controls (Column 2), additional geographical controls (Columns 3 and 4) and region fixed effects (Column 5). These results are remarkably stable and remain significant on the 1%- and 5%-level across specifications.

In addition, a similar qualitative pattern emerges from the analysis of the impact of climatic characteristic on preference for cautiousness in the SCCS. In particular, Column 6 shows a negative and highly significant association between temperature volatility and preference for cautiousness, as captured by the sleeping proximity of parents to infant reported in SCCS, as well as a highly significant positive association between temperature spatial correlation and preference for cautiousness.[39] Reassuringly, the results are robust to the potentially confounding effect of the household's dwelling structure.

Further more, as established in Table F.4, the effect of temperature volatility and spatial correlation on loss aversion across ethnic groups, as captured by sleeping proximity of parents to infants, is robust to potentially confounding effect of social proximity as captured by the Kinship Tightness Index and its individual components calculated according to the methodology of Enke (2019).

[39]While sleeping proximity of parents to infants may reflect convenient as well as the fear of loosing a child during the night, the intricate negative association between climatic volatility and the positive one with spatial correlation is highly unlikely to be related for preference leisure or convince.

Table F.1: Determinants of Loss Aversion: Ethnic Level

	Preferences for Cautiousness					
	Ethnographic Atlas					SCCS
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Volatility)	-0.145***	-0.116***	-0.070***	-0.103***	-0.077***	-0.654***
	(0.021)	(0.018)	(0.021)	(0.027)	(0.025)	(0.211)
Temperature (Spatial Correlation)	0.070***	0.066***	0.070***	0.075***	0.049**	0.533***
	(0.026)	(0.024)	(0.023)	(0.022)	(0.020)	(0.198)
Temperature (Mean)	0.006	-0.004	-0.074***	-0.045*	-0.020	0.078
	(0.022)	(0.020)	(0.026)	(0.027)	(0.024)	(0.209)
Absolute Latitude			-0.118***	-0.072**	-0.028	0.487
			(0.034)	(0.036)	(0.038)	(0.296)
Elevation (Mean)			-0.036**	-0.014	-0.003	-0.512**
			(0.017)	(0.026)	(0.026)	(0.208)
Land Suitability (Mean)				-0.037*	-0.024	0.319*
				(0.020)	(0.023)	(0.182)
Multi-Dwelling Household						-0.093
						(0.330)
Ethnographic Controls	No	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	No	No	Yes	Yes	Yes
Continental FE	No	No	No	No	Yes	Yes
Adjusted-R^2	0.28	0.40	0.41	0.42	0.47	0.13
Observations	471	471	471	471	471	186

Note: Using OLS regression, this table suggests based on the Ethnographic Atlas and the SCCS that preferences for loss aversion is negatively affected by temperature volatility (idiosyncratic risk) and positively affected by temperature spatial correlation (aggregate uncertainty) in the region. Column 1-5 focus on preference for strategy over luck in games based on v35 in the Ethnographic Atlas, and column 6 on preference for Sleeping Proximity of Parents to Infant (v23) in the SSCS. Additional geographical controls are standard deviation of land suitability, distance to coast or river, and the level of precipitation. Ethnographic controls include intensity of agriculture and animal husbandry, settlement structure, and plow use. Region fixed effects include dummy variables for Americas, Old World and Africa that may govern the characteristics of ethnic groups. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

F.2.2 Loss Averse Behavior

This section explores the effect of climatic volatility as well as spatial correlation in climatic shocks on the degree of loss aversion at an ethnic level, as captured by the observed manifestations of loss aversion in human behavior. In particular, it explores the effect of these climatic characteristics on: (i) the diversification in the sources of subsistence consumption, and (ii) choices of crops that are potentially less vulnerable to climatic fluctuations.

The association between climatic characteristics (and their hypothesized impact on loss aversion) and the degree of diversification in the production of the subsistence consumption is explored in Columns (1) and (2) of Table F.2. A-priori one would have expected, that in a more volatile environment the degree of diversification will be larger. Nevertheless, the findings suggest that the degree of diversification of productive activities at the ethnic group level is *negatively* associated with temperature volatility and positively affected by its spatial correlation. Thus, ethnic groups that are characterized by greater climatic volatility tend to be less diversified, reflecting the findings that in volatile environment, the trait of loss-neutrality is dominating, leading naturally to production choices that are based on higher rates of return rather than loss-avoidance.

Table F.2: Determinants of Loss Averse Behavior: Ethnic Level

	Behavior				
	Diversification		Crop Choice: Roots vs Cereals		
	(1)	(2)	(3)	(4)	(5)
Temperature (Volatility)	-0.061**	-0.062***	-0.889***	-0.899***	-0.939***
	(0.024)	(0.024)	(0.231)	(0.233)	(0.249)
Temperature (Spatial Correlation)	0.042**	0.050**	0.272**	0.271**	0.283**
	(0.021)	(0.022)	(0.117)	(0.118)	(0.120)
Temperature (Mean)	0.020	0.015	-0.715***	-0.701***	-0.520**
	(0.025)	(0.025)	(0.259)	(0.255)	(0.252)
Absolute Latitude	0.105***	0.105***	-0.788***	-0.800***	-0.705***
	(0.031)	(0.031)	(0.226)	(0.223)	(0.222)
Elevation (Mean)	-0.034*	-0.030	-0.562***	-0.585***	-0.517**
	(0.018)	(0.022)	(0.171)	(0.219)	(0.210)
Crop Yield (pre-1500CE) (Mean)	-0.012	-0.019	0.310***	0.358***	0.673***
	(0.017)	(0.018)	(0.114)	(0.125)	(0.162)
Distance to the coast line	-0.048***	-0.055***	-0.077	-0.094	-0.109
	(0.015)	(0.016)	(0.087)	(0.091)	(0.093)
Precipitation (mm/month) (Mean)	0.050**	-0.004	0.008	0.022	-0.073
	(0.020)	(0.027)	(0.123)	(0.122)	(0.120)
Suitability for Cereals (Mean)					-0.329**
					(0.131)
Suitability for Roots (Mean)					-0.086
					(0.126)
Ethnographic Controls	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	Yes	No	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.07	0.08			
Pseudo-R^2			0.51	0.51	0.52
Observations	1183	1183	853	853	849

Notes: Using OLS regression in column 1 – 2 and probit regression in column 3 – 5, this table suggests based on the Ethnographic Atlas that diversification of activities and choice of crop is negatively affected by the temperature volatility (idiosyncratic risk) and positively affected by the temperature spatial correlation (aggregate uncertainty) in the region. Column 1-2 focus on diversification of production activities based on v1 – v5 in the Ethnographic Atlas and columns 3 – 5 on choice of roots as a major crop (v29), as opposed to cereals. Additional geographical controls are land suitability gini, elevation range and precipitation level. Ethnographic controls include settlement structure and major crops for column 1 – 2 and intensity of agriculture, animal husbandry, settlement structure and plow use for column 3 – 5. Region fixed effects include dummy variables for Americas, Old World Europe and Africa. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

The association between climatic characteristics (and their hypothesized impact on loss aversion) and the choices of crops that are potentially less vulnerable to climatic fluctuations is explored in Columns (3)-(5) of Table F.2. Due to the greater resistance of roots and tubers in comparison to cereals, to the adverse effects of climatic shocks, one would have expected, a-priori, that roots and tubers would be adopted in a more volatile environment.[40] Nevertheless, the findings suggest that ethnic groups that were situated in regions with a greater temperature volatility roots or tubers are less likely to be the major crops, while those that are situated in regions with a higher spatial correlation of temperature shocks would adopt roots with a higher probability.[41] These findings reflect the

[40]Moreover, since volatility increases the risk appropriation by either the government or other individuals (Mayshar et al., 2016) the adoption of these crops, *ceteris paribus*, would mitigate the risk of appropriation.

[41]In particular, as shown in column (5), the result remains highly statistically significant when the confounding effects of potential

hypothesized selection of loss-neutrality in a volatile environment, leading naturally to production choices that are based on higher rates of return rather than loss-avoidance.

Hence, the focus on observed behavior, rather than preferences, further demonstrates the highly significant negative association between the degree of loss aversion and intertemporal temperature volatility, as well as positive association with spatial correlation of temperature shocks.

As showcased in F.3, the relationship between intertemporal temperature volatility and spatial correlation in temperature and the proposed proxies of loss aversion are unique to ethnographic characteristics that reflect cautiousness about losses, rather than a broader spectrum of ethnographic traits. Moreover, it is unlikely to be driven by unobservables.

F.3 Robustness of Results based on the Ethnographic Atlas

F.3.1 Selection on Unobservables

This subsection examines the likelihood that omitted variables could alter the qualitative findings. Table D.3 suggests that it is very improbable that omitted variables could have affected the qualitative results. In particular, as established in column (8) , (using columns (7) as the baseline specifications), the estimated value of the coefficient on intertemporal temperature volatility and temperature spatial correlation, if unobservables where as correlated as the observables (i.e., Oster's β^* statistic), are very close to the estimated OLS coefficients. Furthermore, since zero does not belong to the interval created by the estimated value on and Oster's β^*, one can reject the hypothesis that the value of the coefficient is driven exclusively by unobservables. In addition, the indexes AET (Altonji et al., 2005; Bellows and Miguel, 2009) and δ (Oster, 2014) measure how strongly correlated unobservables would have to be in order to account for the full size of the coefficient on temperature volatility and spatial correlation (v and c subscripts correspondingly), are different from the critical value of 1.

F.3.2 Placebo Tests

This section suggests that the relationship between intertemporal temperature volatility and spatial correlation in temperature and the proposed proxies of loss aversion are unique to ethnographic characteristics that reflect cautiousness about losses, rather than a broader spectrum of ethnographic traits. A wide spectrum of placebo tests demonstrates that indeed intertemporal temperature volatility and spatial correlation in temperature do not affect other cultural characteristics at the ethnic group level.

In particular, as established in Table F.3, ethnographic characteristics such as sex taboos, group's political integration, inheritance property rights, gender roles in agriculture, attitude towards premarital sex, and belief in the evil eye are affected neither by intertemporal temperature volatility nor by the temperature spatial correlation, lending further credence to the proposed hypothesis.

suitability for roots and cereals are accounted for.

Table F.3: Determinants of Loss Aversion across Ethnic Groups: Placebo Tests

	(1) Sex Taboos	(2) Political Integration	(3) Property Rights	(4) Gender Roles	(5) Premarital Sex	(6) Evil Eye Belief
Temperature (Volatility)	0.124	0.068	0.009	-0.047	0.209	-0.003
	(0.154)	(0.129)	(0.024)	(0.040)	(0.149)	(0.058)
Temperature (Spatial Correlation)	0.044	-0.118	-0.007	0.017	-0.150	-0.008
	(0.116)	(0.128)	(0.022)	(0.035)	(0.136)	(0.052)
Temperature (Mean)	0.060	0.210**	0.012	-0.080**	-0.297**	0.066*
	(0.188)	(0.089)	(0.028)	(0.034)	(0.136)	(0.040)
Absolute Latitude	-0.050	0.410**	0.025	0.019	-0.367**	0.106
	(0.229)	(0.168)	(0.033)	(0.048)	(0.175)	(0.076)
Elevation (Mean)	0.128	-0.370***	0.057**	-0.048	-0.138	0.134**
	(0.145)	(0.128)	(0.023)	(0.033)	(0.121)	(0.062)
Land Suitability (Mean)	0.036	0.118	-0.011	-0.013	-0.075	0.058
	(0.097)	(0.096)	(0.015)	(0.028)	(0.101)	(0.040)
Ethnographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.19	0.41	0.60	0.04	0.07	0.23
Observations	374	314	816	737	586	199

Notes: Using OLS regression, this table suggests that behavioral characteristics that are orthogonal to loss aversion (i.e., severity of post-partum sex taboos, level of political integration, presence of property rights, presence of distinct gender roles in agriculture, norms of premarital sexual behavior and presence of evil eye belief) are neither affected by temperature volatility (idiosyncratic risk), nor by temperature spatial correlation (aggregate uncertainty) in the parental country of origin. Additional geographical controls are land suitability standard deviation, distance to coast or river and precipitation level. Ethnographic controls include intensity of agriculture and animal husbandry, settlement structure and plow use. Region fixed effects include dummy variables for Americas, Old World and Africa that may govern the characteristics of ethnic groups. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

F.3.3 Robustness to Social Proximity

Table F.4 documents that the effect of temperature volatility and spatial correlation on the sleeping proximity is robust to controlling for the social proximity preference which are captured by the Kinship Tightness Index and its individual components calculated according to the methodology of Enke (2019).

Table F.4: Determinants of Parental Sleeping Proximity to Children (SCCS): Robustness to Social Proximity

	Sleeping Proximity				
	(1)	(2)	(3)	(4)	(5)
Temperature (Volatility)	-0.768***	-0.762***	-0.763***	-0.772***	-0.771***
	(0.264)	(0.265)	(0.263)	(0.266)	(0.266)
Temperature (Spatial Correlation)	0.665***	0.625**	0.651***	0.674***	0.676***
	(0.238)	(0.251)	(0.239)	(0.238)	(0.241)
Extended Families	0.226				
	(0.412)				
Joint Postmarital Residence		0.233			
		(0.596)			
Non-Bilateral Descent			-0.017		
			(0.403)		
Segmented Communities or Clans				-0.034	
				(0.405)	
Kinship Tightness Index					-0.083
					(0.762)
Ethnographic Controls	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	Yes	Yes	Yes	Yes	Yes
Continental FE	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.13	0.13	0.13	0.13	0.13
Observations	123	123	123	122	122

Note: This table suggests based on the SCCS that preferences sleeping proximity to children is negatively affected by the temperature volatility (idiosyncratic risk) and positively affected by the temperature spatial correlation (aggregate uncertainty) in the region. The effect is orthogonal to the social proximity as measured by the Kinship Tightness Index and its individual components according to Enke (2019). Additional geographical controls are land suitability standard deviation, distance to coast or river and precipitation level. Ethnographic controls include intensity of agriculture and animal husbandry, settlement structure and plow use. All independent variables have been normalized by subtracting their mean and dividing by their standard deviation. Thus, all coefficients can be compared and show the effect of a one standard deviation in the independent variable. Heteroskedasticity robust standard error estimates clustered at the parental country of origin level are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests.

G Variable Definitions

G.1 Outcome Variables

G.1.1 Measures of Loss Aversion

- **Preferred Job Characteristic: Security vs Others (Second-generation analysis: GSS)**: Based on the answer to the question "Would you please look at this card and tell me which one thing on this list you would most prefer in a job" taken from the core module of the General Social Survey. Coded 5 if "No danger of being fired" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most preferred, 2 – fourth most preferred, 1 – least preferred.

- **Preferred Job Characteristic: Security vs Salary (Second-generation analysis: GSS)**: Based on the answers to the question "Would you please look at this card and tell me which one thing on this list you would most prefer in a job?" taken from the core module of the General Social Survey. Computed as the difference between the ranks of characteristics "High Income" and "No danger of being fired", normalizing the lowest value to 1 (i.e., JOBINC - JOBSEC + 5).

- **Preferred Job Characteristic: Security vs Salary (Second-generation analysis: ESS)**: Based on the answers to the question "For you personally, how important do you think each of the following would be if you were choosing a job? A secure job?/ A high income?" taken from the "Family work and well-being" module in the second and fifth rounds of the European Social Survey. Computed as the difference between the importance of characteristics "Secure job" and "High Income", normalizing the lowest value to 1 (i.e., ipjbscr - ipjbhin + 5).

- **Preferred Job Characteristic: Security vs Other (Individual-level analysis: WVS)**: Based on the answers to the question "Now I would like to ask you something about the things which would seem to you, personally, most important if you were looking for a job. Here are some of the things many people take into account in relation to their work. Regardless of whether you're actually looking for a job, which one would you, personally, place first if you were looking for a job?" taken from the core module of the World Values Survey. Coded as 1 if "A safe job with no risk of closing down or unemployment" was an answer and coded 0 otherwise.

- **Preferences for Cautiousness (Ethnic group-level: Ethnographic Atlas)**: Based on "Games" from Ethnographic Atlas (i.e., v35_1, v35_2, v35_3). Coded 2 if strategy element is present in the games, while the chance element is not (i.e., v35_3=2 and v35_2=1), coded 1 if both the strategy and chance elements are present or absent (i.e., v35_3=v35_2) and coded 0.5 if only chance component is present (i.e., v35_3=1 and v35_2=2).

- **Preferences for Cautiousness (Ethnic group-level: SCCS)**: Based on "Sleeping proximity of parents to infant" from SCCS (v23).

- **Diversification (Ethnic group-level: Ethnographic Atlas)**: Constructed based on the composition of subsistence activities (e.g., hunting, gathering, agriculture and animal husbandry) in food production. The measure is constructed as an inverse of Herfindahl-Hirschman index for the shares of each of the modes in total production.

- **Crop Choice: Roots vs Cereals (Ethnic group-level: Ethnographic Atlas)**: Based on the "Major Crop Type" characteristic from the Ethnographic Atlas (i.e., v29). Coded 1 if roots or tubers are the major cultivated crop (i.e., v29=4), coded 0 if the major crop is cereal (i.e, v29 == 1).

G.1.2 Placebo Measures

- **Preferred Job Characteristic: Satisfaction vs Others (Second-generation analysis: GSS)**: Based on the answer to the question "Would you please look at this card and tell me which one thing on this list you would most prefer in a job?" taken from the core module of the General Social Survey. Coded 5 if "Work important and gives a feeling of accomplishment" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most important, 2 – fourth most important, 1 – least important.

- **Preferred Job Characteristic: Hours vs Others (Second-generation analysis: GSS)**: Based on the answer to the question "Would you please look at this card and tell me which one thing on this list you would most prefer in a job?" taken from the core module of the General Social Survey. Coded 5 if "Workings hours are short, lots of free time" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most important, 2 – fourth most important, 1 – least important.

- **Preferred Job Characteristic: Promotion opportunities vs Others (Second-generation analysis: GSS)**: Based on the answer to the question "Would you please look at this card and tell me which one thing on this list you would most prefer in a job?" taken from the core module of the General Social Survey. Coded 5 if "Chances for advancement" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most important, 2 – fourth most important, 1 – least important.

- **Preferred Job Characteristic: Training opportunities vs Ability to use own initiative (Second-generation analysis: ESS)**: Based on the answers to the question "For you personally, how important do you think each of the following would be if you were choosing a job? Job offered good training opportunities?/ Job enabled you to use own initiative?" taken from the "Family work and well-being" module in the second and fifth rounds of the European Social Survey. Computed as the difference between the importance of characteristics "Job offered good training opportunities" and "Job enabled you to use own initiative" (i.e., ipjbtro - ipjbini).

- **Preferred Job Characteristic: Salary vs Training opportunities (Second-generation analysis: ESS)**: Based on the answers to the question "For you personally, how important do you think each of the following would be if you were choosing a job? A high income?/ Job offered good training opportunities?" taken from the "Family work and well-being" module in the second and fifth rounds of the European Social Survey. Computed as the difference between the importance of characteristics "A high income?" and "Job offered good training opportunities" (i.e., ipjbhin - ipjbtro).

- **Preferred Job Characteristic: Salary vs Ability to use own initiative (Second-generation analysis: ESS)**: Based on the answers to the question "For you personally, how important do you think each of the following would be if you were choosing a job? A high income?/ Job enabled you to use own initiative?" taken from the "Family work and well-being" module in the second and fifth rounds of the European Social Survey. Computed as the difference between the importance of characteristics "A high income?" and "Job enabled you to use own initiative" (i.e., ipjbhin - ipjbini).

- **Sex Taboos (Ethnic group-level: Ethnographic Atlas)**: Taken from Ethnographic Atlas "Post-partum Sex Taboos" (v36)

- **Political Integration (Ethnic group-level: Ethnographic Atlas)**: Taken from Ethnographic Atlas "Political Integration" (v90)

- **Property Rights (Ethnic group-level: Ethnographic Atlas)**: Based on the " Inheritance Rule for Real Property (Land)" from Ethnographic Atlas (v74). Coded 0 if land property rights do not exist (i.e., v74=1), coded 1 otherwise.

- **Gender Roles (Ethnic group-level: Ethnographic Atlas)**: Based on the "Sex Differences: Agriculture " from Ethnographic Atlas (v54). Coded 1 if gender roles in agriculture exist (i.e., v54=5 or 6 or 7 or 8), coded 0 if gender roles do not exists (i.e., v54=1 or 2 or 3 or 4).

- **Political Integration (Ethnic group-level: Ethnographic Atlas)**: Taken from Ethnographic Atlas "Norms of Premarital Sexual Behavior of Girls" (v78)

- **Evil Eye Belief (Ethnic group-level: SCCS)**: Taken from SCCS "Evil Eye Belief" (v1189)

G.1.3 Measures of Cultural Values

- **LTO (Second-generation analysis: GSS)**: Based on the answer to the question "Do you smoke?" taken from the core module of the General Social Survey.

- **Obedience (Second-generation analysis: GSS)**: Based on the answer to the question "If you had to choose, which thing on this list would you pick as the most important for a child to learn to prepare him or her for life?" taken from the core module of the General Social Survey. Coded 5 if "To Obey" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most important, 2 – fourth most important, 1 – least important.

- **Altruism (Second-generation analysis: GSS)**: Based on the answer to the question "If you had to choose, which thing on this list would you pick as the most important for a child to learn to prepare him or her for life?" taken from the core module of the General Social Survey. Coded 5 if "To help others when they need help" is the most preferred characteristic, 4 if it is the second most preferred, 3 – third most important, 2 – fourth most important, 1 – least important.

- **Equality (Second-generation analysis: GSS)**: Based on the answer to the question "It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes. Do you agree or disagree?" taken from the "ISSP Social Inequality" module of the General Social Survey.

- **Gender (Second-generation analysis: GSS)**: Based on the answer to the question "Do you approve or disapprove of a married woman earning money in business or industry if she has a husband capable of supporting her?" taken from the core module of the General Social Survey.

- **Government (Second-generation analysis: GSS)**: Based on the answer to the question "As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them? Executive branch of the federal government" taken from the core module of the General Social Survey.

- **LTO (Second-generation analysis: ESS)**: Based on the answers to the question "Do you generally plan for your future or do you just take each day as it comes? Please express your opinion on a scale of 0 to 10, where 0 means 'I plan for my future as much as possible' and 10 means 'I just take each day as it comes' " taken from the "Timing of life" module in the third round of the European Social Survey.

- **Obedience (Second-generation analysis: ESS)**: Based on the answers to the question "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. She/he believes that people should do what they're told. She/he thinks people should follow rules at all times, even when no-one is watching" taken from the "Human Values" module of the European Social Survey.

- **Altruism (Second-generation analysis: ESS)**: Based on the answers to the question "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. It's very important to her/him to help the people around her/him. She/he wants to care for their well-being" taken from the "Human Values" module of the European Social Survey.

- **Equality (Second-generation analysis: ESS)**: Based on the answers to the question "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. She/he thinks it is important that every person in the world should be treated equally. She/he believes everyone should have equal opportunities in life" taken from the "Human Values" module of the European Social Survey.

- **Gender (Second-generation analysis: ESS)**: Based on the answers to the question " Using this card, please say how much you agree or disagree with each of the following statements. A woman should be prepared to cut down on her paid work for the sake of her family" taken from the "Welfare Attitudes" module in the fourth round of the European Social Survey.

- **Strong Government (Second-generation analysis: ESS)**: Based on the answers to the question "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. It is important to her/him that the government ensures her/his safety against all threats. She/he wants the state to be strong so it can defend its citizens" taken from the "Human Values" module of the European Social Survey.

- **Tradition (Second-generation analysis: ESS)**: Based on the answers to the question "Now I will briefly describe some people. Please listen to each description and tell me how much each person is or is not like you. Use this card for your answer. Tradition is important to her/him. She/he tries to follow the customs handed down by her/his religion or her/his family" taken from the "Human Values" module of the European Social Survey.

G.2 Main Independent Variables: Temperature Temporal Volatility and Spatial Correlation

- **Temperature Volatility**: Volatility of temperature constructed using v3.2 of the Climatic Research Unit (CRU) database following the method of Durante (2009). Computed for each month as the temperature variance over all years, and averaged across months. Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Temperature Spatial Correlation**: Spatial Correlation of temperature shocks constructed using v3.2 of the Climatic Research Unit (CRU) database following the method of Durante (2009). Computed as the correlation between monthly deviations of temperature in a given cell and its neighbors over all months and years, averaged over the neighbors. Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Historic Temperature Volatility**: Historic volatility of temperature constructed using paleoclimatic date on temperature anomalies reconstructed by Mann et al. (2009). Computed as intern-annual variance of temperature anomalies over the years 500 – 2000 and 500 – 1000. Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Effective Temperature Volatility (pre-1500)**: Effective temperature volatility before the Columbia Exchange is calculated using v3.2 of the Climatic Research Unit (CRU) database as an average of inter-annual variances of temperature for four months prior to the beginning of growth cycle of the pre-Columbian, yield-maximizing crop, which is identified as an indigenous crop that maximizes potential caloric yield, using the methodology developed in Galor and Özak (2016). Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Effective Temperature Volatility (change)**: Change in the effective temperature volatility due to the Columbia Exchange is calculated using v3.2 of the Climatic Research Unit (CRU) database as a difference between effective potential volatility (pre-1500) and effective potential volatility (post-1500). Where effective potential volatility (post-1500) is an average of inter-annual variances of temperature for four months prior to the beginning of growth cycle of the post-Columbian, yield-maximizing crop, which is identified as a crop that maximizes potential caloric yield, compared to any other crop, using the methodology developed in Galor and Özak (2016). Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Effective Temperature Spatial Correlation (pre-1500)**: Effective temperature spatial correlation before the Columbia Exchange is calculated using v3.2 of the Climatic Research Unit (CRU) database as the correlation between monthly deviations of temperature in a given cell and its neighbors over four months prior to the beginning of growth cycle of the pre-Columbian, yield-maximizing crop, which is identified as an indigenous crop that maximizes potential caloric yield, using the methodology developed in Galor and Özak (2016). Measure is calculated at the grid cell level and then aggregated at the regional level.

- **Effective Temperature Spatial Correlation (change)**: Change in the effective temperature spatial correlation due to the Columbia Exchange is calculated using v3.2 of the Climatic Research Unit (CRU) database as a difference between effective temperature spatial correlation (pre-1500) and effective temperature spatial correlation (post-1500). Where effective temperature spatial correlation (post-1500) is correlation between monthly deviations of temperature in a given cell and its neighbors over four months prior to the beginning of growth cycle of the post-Columbian, yield-maximizing crop, which is identified as a crop that maximizes potential caloric yield, compared to any other crop, using the methodology developed in Galor and Özak (2016). Measure is calculated at the grid cell level and then aggregated at the regional level.

G.3 Controls

G.3.1 Geographical Controls

- **Absolute latitude**: The absolute value of the latitude of a country's approximate geodesic centroid, as reported by the CIA's World Factbook.

- **Mean Elevation**: The mean elevation of a country in km above sea level, calculated using geospatial elevation data reported by the G-ECON project (Nordhaus, 2006) at a 1-degree resolution. The interested reader is referred to the G-ECON project web site for additional details.

- **Mean distance to nearest waterway**: The distance, in thousands of km, from a GIS grid cell to the nearest ice-free coastline or sea-navigable river, averaged across the grid cells of a country. This variable was originally constructed by Gallup et al. (1999) and is part of Harvard University's CID Research Datasets on General Measures of Geography.

- **Percentage of population living in tropical, subtropical and temperate zones**: The percentage of a country's population in 1995 that resided in areas classified as tropical by the Köppen-Geiger climate classification system. This variable was originally constructed by Gallup et al. (1999) and is part of Harvard University's CID Research Datasets on General Measures of Geography.

- **Land Suitability**: Average probability within a region that a particular grid cell will be cultivated as computed by Ramankutty et al. (2002).

- **Land Suitability (Range)**: Range of probabilities within a region that a particular grid cell will be cultivated as computed by Ramankutty et al. (2002).

- **Land Suitability (Gini)**: Gini of probabilities within a region that a particular grid cell will be cultivated as computed by Ramankutty et al. (2002).

- **Land Suitability (Std.)**: Standard deviation of probabilities within a region that a particular grid cell will be cultivated as computed by Ramankutty et al. (2002).

- **Island nation dummy**: An indicator for whether or not a country shares a land border with any other country, as reported by the CIA's World Factbook online.

- **Landlocked dummy**: An indicator for whether or not a country is landlocked, as reported by the CIA's World Factbook online.

- **Neolithic Transition Timing**: The number of thousand years elapsed (as of the year 2000) since the majority of the population residing within a country's modern national borders began practicing sedentary agriculture as the primary mode of subsistence (Putterman, 2008). See the Agricultural Transition Data Set website

http://www.econ.brown.edu/fac/louis_putterman/agricultural%20data%20page.htm

for additional details on primary data sources and methodological assumptions.

- **Total land area**: The total land area of a country, in millions of square kilometers, as reported for the year 2000 by the World Bank's World Development Indicators online.

- **Density of Weather Stations**: Density of weather measuring stations is constructed using v3.2 of the Climatic Research Unit (CRU) database as a number of weather stations, used to measure the climatic data, per unit of area and then aggregated at the regional level.

G.3.2 Ethnographic Controls

- **Intensity of Agriculture**: Taken from Ethnographic Atlas "Intensity of Agriculture" (v28)

- **Intensity of Animal Husbandry**: Taken from Ethnographic Atlas "Animal Husbandry" (v4)

- **Settlement Patterns**: Taken from Ethnographic Atlas "Settlement Patterns" (v30)

- **Plow Use**: Taken from Ethnographic Atlas "Animals and Plow Cultivation" (v39). Coded as a separate dummy variable for each category.

- **Multi-dwelling Household**: Base on the "Household Form" characteristic from SCCS (i.e., SCCSv67). Coded as 1 if household has multiple dwellings (i.e., SCCSv67 $\in \{5, 6, 7, 8\}$ and coded as 0 otherwise.

G.3.3 Individual Controls

- **Individual level controls (Second-generation analysis: GSS)**: Age, Gender, Education level (highest year of school completed), Religion in which raised (coded as a separate dummy variable for each denomination), Income (coded as a separate dummy variable for each income bracket) for each individual in the GSS data sets.

- **Individual level controls (Second-generation analysis: ESS)**: Age, Gender, Education level (classified according to ICSDE, coded as a separate dummy variable for each category), Religiosity (based on the question "How often pray apart from at religious services"), Income (coded as a separate dummy variable for each income bracket) for each individual in the ESS data sets.

- **Individual level controls (Individual-level analysis: WVS)**: Age, Gender, Education level (Highest educational level attained, coded as a separate dummy variable for each category), Religiosity (based on the question "How often do you attend religious services"), Income (coded as a separate dummy variable for each income bracket) for each individual in the WVS data sets.

G.3.4 Other Controls

- **Terrain roughness**: The degree of terrain roughness of a country, calculated using geospatial surface undulation data reported by the G-ECON project (Nordhaus, 2006) at a 1-degree resolution. The interested reader is referred to the G-ECON project web site for additional details.

- **Population Density in 1500CE**: Population density (in persons per square km) in 1500C E as reported by McEvedy et al. (1978) , divided by total land area, as reported by the World Bank's World Development Indicators.

- **Urbanization Rate in 1500CE and 1800CE**: Share of population living in cities as reported in Acemoglu et al. (2005).

- **GDP per capita in 1870CE, 1913CE**: Income per capita as reported by Maddison (2003) . The data is available at
  `http://www.ggdc.net/maddison/Historical_Statistics/horizontal-file_02-2010.xls`.

- **Major religion shares**: Share of major religion in each country as reported in La Porta et al. (1999).

- **Legal Origins**: Dummy variables for origin of legal system as identified in La Porta et al. (1999).

- **GDP per capita**: GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 U.S. dollars for the year 2005 from the World Bank's World Development Indicators and for 2005 from Penn World Table v8 Feenstra et al. (2015).

- **Institutions**: Democracy index from Polity IV project.

- **Trust**: Share of population that have generalized trust. Based on the following question taken from the integrated file for waves 1-5 of the WVS: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?". An individual has trust if she answered "Most people can be trusted".

- **Power Distance**: Dimension of national culture identified by Hofstede (2001) , which measures the degree to which there exists a preference for hierarchical power structures or inequality in economic, political or other societal dimensions. Scale between 0 (Horizontal) to 100 (Vertical).[42]

[42] Hofstede and Hofstede (n.d., p.61) defines it as "Power distance can therefore be defined as the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. Institutions are the basic elements of society, such as the family, the school, and the community; organizations are the places where people work."

- **Individualism**: Dimension of national culture identified by Hofstede (2001) , which measures the degree to which a society is individualistic as opposed to collectivistic. Scale between 0 (Collectivistic) to 100 (Individualistic).[43]

- **Cooperation**: Dimension of national culture identified by Hofstede (2001) , which measures the degree to which a society is cooperative. Scale between 0 (Non-cooperative) to 100 (Cooperative).[44]

- **Uncertainty Avoidance**: Dimension of national culture identified by Hofstede (2001) , which measures the degree to which a society is tolerant of the ambiguous and the unpredictable. Scale between 0 (Intolerant) to 100 (Tolerant).[45]

- **Ancestry Adjustment**: Original data is adjusted by ancestry using the method and data from Putterman and Weil (2010).

- **Regional Data**: For regions within a country, data is computed using GIS software to compute the area of each region's polygon in the corresponding shape file of the Seamless Digital Chart of the World. Whenever possible, the same primary data sources as the ones used in the sources for the country level data is used. E.g. regional agricultural suitability is constructed using the data from Ramankutty et al. (2002).

[43]Hofstede and Hofstede (n.d., p.92) defines it as follows: "Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after him- or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onward are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty."

[44]Hofstede and Hofstede (n.d., p.140) defines this dimension as Masculinity vs Femininity, since he found gender based differences in the answers to the questions that defined this value.

[45]According to Hofstede and Hofstede (n.d., p.191) "Uncertainty avoidance can therefore be defined as the extent to which the members of a culture feel threatened by ambiguous or unknown situations."