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The Impact of Climate Change on the Palestinian Sectoral Reallocation of Labor

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ABSTRACT

The research leverages yearly variations in climate variables, such as rainfall and temperature, across the West Bank from 1999 to 2018 to assess their influence on individuals' decisions to stay in the agricultural sector. The main findings suggest that an increase in rainfall in the previous year is associated with a higher proportion of workers in the agricultural sector, especially in regions where agriculture is the primary economic activity. Temperature variation is also an important factor. An increase in the maximum temperature will generally have a negative effect on the supply of labor in the agricultural sector, while an increase in the minimum temperature may have a positive effect. However, this effect varies across different regions of the West Bank, reflecting the diverse agricultural practices and irrigation methods employed. The study also examines two potential mechanisms through which climate change affects labor decisions: agricultural labor migration to the Israeli labor market and how climate shocks affect agricultural wages.

KEYWORDS: Labor Supply; Climate Change, Agriculture; West Bank
JEL CLASSIFICATIONS: J01; J43; Q54

1. INTRODUCTION

Climate change has emerged as one of the most pressing global challenges, with wide-ranging implications for economies and societies globally (Abbas et al. 2023). The effects of climate change on economic and human capital growth and development are a subject of debate in the literature, where it is argued they entail a combination of outcomes (Malpede and Percoco 2023). In particular, a positive correlation has been observed between escalating temperatures and reduced income levels (Zhang, Zhang, and Chen 2017). It was revealed that there is a significant association between weather shocks and diminished investment rates, as well as decreased labor productivity; the impact of these shocks was found to be more pronounced in countries with lower income levels (Acevedo et al. 2020). A recent study pointed to increased precipitation and temperature being associated with an improved Human Development Index; the inclusion of potential evapotranspiration counteracts the advantages of higher precipitation, particularly in economies heavily dependent on agriculture (Malpede and Percoco 2023).

The Palestinian economy, situated in a region already marked by complex geopolitical circumstances, is particularly vulnerable to the impacts of climate change (Jarrar 2015). Agriculture, though declining, still plays a significant role in Palestine's economy, contributing to 22 percent of total exports as documented in the National Agriculture Sector Strategy of 2014–16 (Ministry of Agriculture 2016). The Palestinian economy is characterized by a diverse range of sectors, each with its own contribution to employment, income, and overall economic growth (Abed 2015). Among these sectors, agriculture employs a significant portion of the workforce and contributes to food security and rural livelihoods (Marzin, Uwaidat, and Sourisseau 2019). Moreover, the domestic agricultural sector holds crucial importance for ensuring the country's food security (Ministry of Agriculture 2016; Tippmann and Baroni 2016). Rain-fed agriculture has traditionally constituted the prevailing agricultural practice in Palestine, forming the cornerstone of agricultural endeavors in the region (Isma'il and Dajani 2021). It has not only served as the means through which Palestinian farmers have maintained their enduring connection to the land but has also been instrumental in the preservation of age-old agricultural wisdom, diverse crop varieties, and the unique quality and flavor of indigenous agricultural products (Tesdell, Othman, and Alkhoury 2019). Nevertheless, the prevalence of rain-fed agriculture in Palestine is primarily due to historical constraints on the use of water resources, resulting from mobility restrictions that have limited Palestinian access to groundwater (UN 1980; Isma'il and Dajani 2021). These constraints have significantly impacted the availability and equitable distribution of water resources across the region, compelling Palestinian farmers to rely heavily on traditional rain-fed agriculture. This historical constraint on water resources has not only shaped prevailing agricultural practices but has also profoundly influenced the types of crops cultivated in each district.[1] In light of the inadequate allocation of water resources, Palestinian farmers find themselves heavily reliant on traditional, rain-fed agriculture, renowned for its distinctive seasonal produce and the requisite localized agricultural expertise necessary for annual land preparation (ibid.). Nevertheless, the increasing volatility in climatic patterns, characterized by fluctuating precipitation, temperature variations, and shifting seasons, has rendered rain-fed farming communities exceedingly vulnerable, jeopardizing their livelihoods (UNDP 2013).

Climate change–induced[2] alterations in temperature patterns, rainfall variability, and extreme weather events pose substantial challenges to agricultural production systems, affecting crop yields, livestock productivity, and water availability (Hasan et al. 2022). While the precise ramifications of climate change on agricultural systems remain uncertain, an increasing body of scholarly works indicates that the sector will encounter a wide array of challenges attributed to climate change, predominantly characterized by adverse effects (FAO 2016; Tippmann and Baroni 2016). Climate change, however, may prompt the reallocation of labor within the Palestinian economy, as changing climatic conditions render certain sectors more or less viable. Understanding the implications of this sectoral reallocation is paramount for policymakers to anticipate potential employment challenges and facilitate smooth transitions of affected workers

[1] In the Jenin District, for example, the cultivation of olives and the production of olive oil, along with almonds, citrus fruits, grapes, and various vegetables, are prominent due to the suitability of rain-fed methods. Similarly, in Tulkarm District, where water resources have historically been limited, the emphasis is on olives, citrus fruits, and vegetables, including tomatoes and cucumbers. These constraints have, in essence, necessitated a diverse array of rain-fed agricultural products across various districts in Palestine, each tailored to the local conditions and resources available.

[2] Climate change refers to long-term alterations in the typical patterns of temperature, precipitation, and other atmospheric conditions within the West Bank region, resulting from various natural and anthropogenic factors. These changes encompass both increasing temperatures and shifts in rainfall patterns, impacting the agricultural sector and subsequently influencing the labor allocation decisions of individuals in the area.

into alternative sectors. By analyzing the labor market dynamics and identifying sectors that may experience increased demand or diminished viability under climate change scenarios, policymakers can devise effective strategies to support affected workers and ensure sustained economic development.

This is the first paper within the Palestinian context that delves into the impact of climate change on individual decision making. We establish a direct connection between these climatic changes and their effects on personal choices, particularly in relation to agricultural practices. Our analysis incorporates the diverse agricultural patterns and irrigation methods across various regions and governorates. Additionally, we underscore the significance of agriculture, land, and food security in the Palestinian context. This research contributes not only by shedding light on the intricate relationship between climate change and individual decisions but also by emphasizing the importance of reducing dependence[3] on the Israeli labor market for workforce employment and the sourcing of food supplies. Also, the implications of this research extend to policymaking in the agriculture sector. The findings contribute to a deeper understanding of the living conditions of the most vulnerable segment within the Palestinian economy—farmers—by uncovering the mechanisms through which climate change variations impact agricultural workers, particularly those operating within the informal sector and households heavily dependent on agriculture. Enhancing working conditions for farmers becomes imperative, with far-reaching societal consequences.

In this paper, we investigate the impact of climate change on the Palestinian economy, focusing specifically on the sectoral reallocation of labor. By examining these dynamics, we can gain insights into the economic repercussions of climate change and identify measures to enhance resilience and sustainability. We employ a linear probability model, utilizing a rich dataset spanning the period from 1999 to 2018 that captures regional and annual variations across the West Bank. By examining climate indicators—such as annual rainfall quantity—and the variation in average annual maximum and minimum temperatures, we will assess their impact on labor market outcomes, with a specific focus on the agriculture sector. To ensure robust and

[3] Agriculture serves as a means to reduce reliance on the Israeli labor market, offering a local employment resource during periods of closure and heightened political instability (Mansour 2010).

unbiased estimates, we employ econometric techniques that control for potential confounding factors, including workers' demographic variables, district characteristics, and year and district fixed effects. By considering these factors, we aim to identify the transmission mechanisms through which climate change influences labor market outcomes in the West Bank.

The main results show that positive variation in the rainfall of the previous year is associated with higher shares of agricultural employment, especially in counties where agriculture is the main economic sector. An increase of one standard deviation in the previous year's rainfall during 1999–2018 is associated with a 0.3 percent increase in the probability of being employed in agriculture. Furthermore, due to the nature of agricultural activities and the main source of irrigation in the West Bank governorates, the analysis shows mixed results regarding the effect of temperature changes on the supply of labor in the agricultural sector in the previous and two preceding years. The maximum (minimum) temperature tends to be negatively (positively) associated with the probability of labor supply in the agricultural sector in the northern governorates and Hebron, respectively. On the other hand, the effect of the increase in the maximum/minimum temperature has an opposite correlation with the labor supply in the agricultural sector in Jericho. The study proposes two mechanisms for the explanation of the results: (1) increased rainfall in the preceding one or two years is significantly associated with a decreased likelihood of Palestinian agricultural workers seeking to work in Israel; (2) the effect of climate-related shocks on the incomes of those employed in agriculture.

The remainder of the study is organized as follows. Section 2 describes the Palestinian contextual settings, in particular, the effect of climate change on agriculture, climate change in the West Bank, and the situation of water resources and farmers' conditions in the West Bank. Section 3 presents a description of the data. Section 4 introduces the empirical approach and the identification strategy and Section 5 summarizes our findings. Section 6 discusses the mechanism linking climate change shocks and labor supply in the agriculture sector. Section 7 presents two robustness checks. And finally, the paper concludes in Section 8.

2. CONTEXTUAL SETTINGS

2.1 The Effect of Climate Change on Agriculture

The impact of climate change on agriculture and agro-ecosystems[4] has significant implications for productivity. While some crops and trees may experience positive effects from higher temperatures, the majority of locally cultivated crops are likely to suffer from decreased water availability (Gitz et al. 2016). The occurrence of climate change–induced droughts poses a serious threat to agro-biodiversity[5] and disrupts the fragile ecosystems on which numerous species rely (FAO 2015). Moreover, the considerable influence of climate change–induced temperature fluctuations on agricultural production affects both crop yields and livestock output. Temperature plays a vital role in initiating essential developmental stages in plants, such as germination, tillering, and fruit ripening (Bhattacharya 2022; Tippmann and Baroni 2017). Consequently, temperature increases can disrupt the timing and duration of these critical physiological processes (Verner, Ashwill, and Wilby 2013; Tippmann and Baroni 2017). For instance, higher temperatures during colder winter months may accelerate the maturation of crops cultivated during those seasons (Lippmann et al. 2019). Although this could be beneficial in regions with limited growing periods, it can lead to reduced yields in other areas by shortening the grain-filling phase of crops like wheat or barley, ultimately resulting in smaller harvests (Khresat 2010; Verner, Ashwill, and Wilby 2013). Furthermore, elevated temperatures[6] before and after harvest can also impact the nutritional quality of various fruit and vegetable crops (Harrison et al. 2011; Verner, Ashwill, and Wilby 2013; Tippmann and Baroni 2017). However,

[4] Agro-ecosystems refer to the agricultural ecosystems where various elements, such as crops, livestock, and the surrounding environment, interact and function as an integrated ecological system. These systems encompass both the cultivated components, like crops and livestock, as well as the non-cultivated elements, such as soil, water, and biodiversity, which collectively influence agricultural production and sustainability (Altieri 2002).

[5] Agro-biodiversity, short for agricultural biodiversity, encompasses the variety and variability of plants, animals, and microorganisms that are essential for food production within agricultural systems. It includes a wide range of crop species, livestock breeds, and other organisms relevant to agriculture. Agro-biodiversity is crucial for ensuring resilience in agriculture, adapting to changing environmental conditions, and maintaining the genetic resources necessary for sustainable food production (Bassignana et al. 2022).

[6] Rising temperatures are anticipated to lead to a reduction in soil carbon levels due to increased evaporation and plant transpiration, ultimately influencing the cycling rates of organic matter and contributing to heightened soil salinity (Verner, Ashwill, and Wilby 2013).

the effects of temperature changes[7] on crops are predominantly understood up to the optimal temperature for crop development, with less knowledge available regarding the consequences beyond these optimal temperatures[8] (FAO 2015; Gitz et al. 2016; Porter et al. 2014).

2.2 Climate Change and Water Security in Palestine

Climate change in the West Bank manifests in rising temperatures and declining rainfall, aligning with the findings and projections by the Intergovernmental Panel on Climate Change (IPCC) concerning the region (Richard and Issac 2012; Gitz et al. 2016). The reduction in annual precipitation exacerbates pressure on local water resources, as diminished rainfall leads to reduced recharge rates for groundwater aquifers and local springs. Furthermore, the escalating temperature amplifies water demand due to the growing Palestinian population. Also, an increase in temperature impacts land use, rendering areas in the West Bank susceptible to drought and desertification (Richard and Issac 2012). See Figure A.4 in the appendix for the rainfall pattern in the West Bank.

Between the Mediterranean Sea and the Jordan River there exist three significant water reservoirs: a pair of underground reservoirs; the Mountain Aquifer and the Coastal Aquifer and a surface-level reservoir (referred to as the Jordan River Basin or Eastern Aquifer) (Lein 2000). Groundwater constitutes the primary water source for Palestinians, with approximately 50 percent of the water drawn from groundwater wells allocated to agricultural purposes. However, water availability per capita[9] is limited in the West Bank, here approximately 75 percent of the

[7] A decrease in temperatures can trigger changes in plants, such as dormancy and vernalization, where some plant species require cold temperatures to end dormancy or initiate flowering (Horvath 2009; Heide and Sønsteby 2011). This process, called vernalization, is vital in the life cycles of certain plants, including various fruit trees and winter crops (Amasino 2005).

[8] Certain plant species may expand into new habitats as minimum temperatures rise (Bradley, Wilcove, and Oppenheimer 2010). Elevated minimum temperatures can also slightly increase plant metabolic rates, benefiting processes like nutrient uptake and photosynthesis when they stay within the plant's optimal range (Whelehan et al. 2022; Hussain et al. 2019).

[9] The per capita water consumption in Israel dwarfs that of Palestinians, surpassing it by at least fourfold, with certain settlements in the West Bank consuming an astonishing 21 times more water per capita than neighboring Palestinian communities (Al-Haq and EWASH 2011).

population is believed to utilize a daily range of 50 to 100 liters for household purposes per individual (Zeitoun 2008; Palestinian Hydrology Group 2006; World Bank 2009).[10] Palestinians face significant hardships because of acute water scarcity due to a lack of control over their water resources (Salem 2007; Salem 2019; Hareuveni 2023). The Israeli-Palestinian water relations are still effectively managed externally as per the Interim Agreement (1995).[11] The agreement aimed to establish a framework for the transfer of partial Palestinian self-governance in the West Bank and Gaza Strip while addressing various issues, including water security (UN 1995).[12] However, the agreement, does not anticipate the substantial demographic growth experienced by the Palestinian population in the West Bank following its signing. The population expanded from 1.54 million in 1997 (excluding East Jerusalem) to 2.7 million in 2022 (PCBS 1998; PCBS 2022). Despite witnessing a substantial 75 percent increase in development, the quantity of water permitted by Israel for extraction by Palestinians has remained unaltered. Moreover, it is noteworthy that the clauses addressing the allocation of water resources do not take into account the division of the West Bank into distinct administrative zones known as Areas A, B, and C,[13] as stipulated in other provisions of the aforementioned agreement (Vishwanath et al. 2014; Hareuveni 2023).

In Jericho (located in the eastern part of the West Bank), climate change is identified as the primary biophysical factor influencing agricultural practices (Al-Qinna and Salahat 2017). The region has experienced a significant decrease in rainfall, with a reduction of over 50 percent compared to the levels recorded a decade ago (Mason and Mimi 2014). This decline in rainfall significantly impacts the recharge rate of groundwater aquifers, which serve as the main water

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[10] Israel's per capita domestic water consumption stands at nearly 350 liters per day (Mimi and Jamous 2010). The World Health Organization's minimum guideline for daily water intake to fulfill essential human consumption and hygiene requirements is 100 liters per individual per day (WHO 2022; Chenoweth et al. 2013).

[11] Commonly known as "Oslo II," the Interim Agreement was signed on September 28, 1995, as a follow-up to the Oslo Accords of 1993. The Water Agreement (Annex 3, Annex 1, Article 40), specifies how the parties are to act in the field of water in the West Bank. This agreement established the Joint Water Committee. The committee was originally intended to operate for only five years, but it still exists.

[12] There is a lack of equity in water allocation between Palestinians in the West Bank and Israelis in favor of Israeli settlements, according to many UN reports. (OHCHR 2013; Amaso and Allen 2020; UN 1980).

[13] Area A is under Palestinian civil and security control in major cities, Area B grants civil control but shared security with Israel, and Area C is primarily under full Israeli civil and security control (Vishwanath et al. 2014). For more information, see www.btselem.org/topic/Area_c

source for Jericho (Tippmann and Baroni 2017). Consequently, the water quantity available for agricultural purposes is diminishing, making current water supplies insufficient for irrigating previously cultivated land. Moreover, the quality of water used for agriculture is deteriorating, primarily due to high salinity levels in groundwater extracted from agricultural wells. This deterioration is attributed to excessive pumping from groundwater wells, reduced rainfall, and low recharge rates (Mason and Mimi 2014).

2.3 Agriculture and Farmers' Conditions in the West Bank

The lack of support for Palestinian farmers can be attributed to various factors. Primarily, the Palestinian government fails to provide sufficient assistance or guidance to farmers, leaving them without the necessary resources to improve their agricultural practices.[14] This absence of governmental support and insurance coverage exacerbates the vulnerability of Palestinian farmers and hinders their ability to recover from losses and adapt to changing circumstances, resulting in significant hardships in maintaining their agricultural businesses (WFP 2023; Salem 2019). On the other hand, the presence of Israeli settlements in the West Bank has led to certain structural challenges within the West Bank. For instance, it is claimed that there may be inequality and disparities in resource allocation and opportunities, particularly affecting Palestinian farmers in Area C (Salem 2019). Additionally, there are observations that Israeli goods, including fruits and vegetables, have become more competitively priced compared to Palestinian products, potentially creating challenges for Palestinian farmers. Furthermore, the region has faced environmental challenges such as climate change impacts, including rising temperatures, reduced rainfall, drought, and shifting rainy season patterns (Gilmont et al. 2018; Yihdego, Salem, and Muhammed 2019; Salem 2019; Gilmont et al. 2016).

3. DATA

This study utilizes data obtained from two major sources. The data for individual sectoral preferences, wages, education, age, and other labor market–related information were collected

[14] Palestinian farmers lack insurance coverage to mitigate financial losses resulting from attacks by Israeli settlers and soldiers, as well as damages caused by natural hazards like climate change impacts and droughts (Khalidi and Taghdisi-Rad 2009; OCHA 2023; Salem 2019)

from the Palestinian Labor Force Survey (PLSFS) conducted by the Palestinian Central Bureau of Statistics (PCBS) from 1999 to 2018. The PLSFS is a quarterly survey where each participating household is interviewed twice consecutively, followed by a two-quarter break, and then interviewed again for two quarters. The main analysis focuses on individuals classified within the labor force according to the PCBS, excluding workers in the Israeli labor market for three reasons. First, the Israeli labor market has distinct characteristics compared to the Palestinian labor market, which may introduce additional factors influencing sectoral reallocation from the agricultural sector—the main objective of this study. Second, the Israeli economy has a greater capacity to adapt to climate change in terms of agricultural activities compared to the Palestinian economy. Third, the Israeli labor market offers significantly higher wages, which can overshadow the real effects of other factors.

The data on the main climate change indicators used in this study, including annual rainfall quantity across the Palestinian territory and maximum and minimum temperatures, were obtained from the Palestinian Meteorological Department.[15] Due to the limited availability of data at a lower level than the district scale, such as the locality or neighborhood level and considering the focus on a relatively small country like Palestine,[16] the data is aggregated at the district level. Unfortunately, only a few districts possess multiple weather stations to measure rainfall levels during the period of interest (1998–2018). Furthermore, the PLFS data is not available at the locality level for all years (after 2012), resulting in a loss of many observations. Despite the relatively uniform size of each district in Palestine, there is significant variation in climate change data across districts and over time due to the region's diverse topography and altitude, particularly in the West Bank (Barghouthi and Gerstetter 2012). The annual rainfall is

[15] For a few missing years' data in specific districts such as Saflit and Tulkarm, estimates were derived from Israeli settlements' stations in each district, provided by the Israeli Meteorological services database: https://ims.gov.il/en/data_gov

[16] The Palestinian territory, in the context of this study, refers to the West Bank area. It's important to note that some sources treat the entire West Bank as a single unit when examining climate change due to the limited data granularity at a more localized level. See:
https://www.jstage.jst.go.jp/article/jscejhe/76/2/76_I_37/_article/-char/ja/
https://www.mdpi.com/2073-4433/14/9/1361
https://www.mdpi.com/2073-4441/15/6/1023
https://www.nature.com/articles/s41597-020-0453-3

highest in the northern part of the West Bank, reaching up to 700 mm, and lowest in the Dead Sea area in the south, ranging from 80 to 100 mm (Barghouthi and Gerstetter 2012).

Table 1 presents data indicating that the proportion of Palestinian laborers engaged in the agricultural sector constitutes a significant share of the workforce in the West Bank, accounting for 17 percent of the total labor force. This variability is primarily driven by pronounced variations in the participation of workers in agricultural activities across different districts throughout the study's period (1999–2018), as illustrated in Figure 1. For instance, the agricultural sector emerges as a significant and pivotal economic activity in districts such as Tubas (35 percent) and Jericho (33 percent), as well as in Tulkarem, Jenin, and Hebron, where it contributes 19, 24, and 17 percent to the local labor force, respectively. It is essential to underscore the substantial fluctuations within the agricultural sector, particularly in specific regions of the West Bank during the period under consideration, particularly during and after the second Intifada (2000–05), as well as in subsequent years. Moreover, Figure 1 demonstrates that the agriculture sector is nearly nonexistent in Jerusalem and Ramallah.

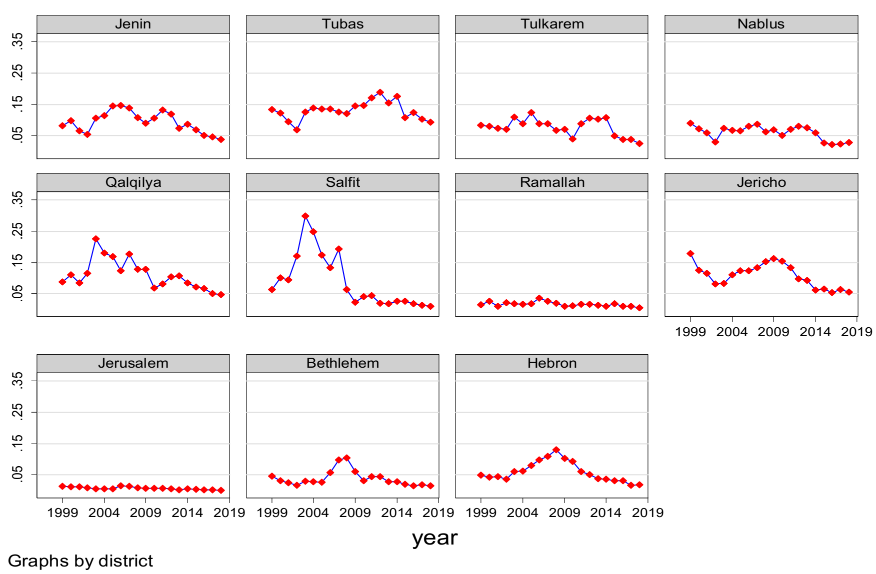
Table 1 – Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Share of Workers in Agriculture Sector					
All West Bank districts	333,871	0.171	0.377	0	1
Jericho	16,663	0.33	0.47	0	1
Northern districts†	159,078	0.2	0.4	0	1
Hebron	68,533	0.177	0.381	0	1
Average max. temperature °C	333,871	23.609	2.567	19.975	33.19
Average min. temperature °C	333,871	14.61	1.629	12.2	20.245
Total annual rainfall (mm)	333,871	475.331	188.632	36.1	1012.8
Share of Male worker	333,871	0.784	0.411	0	1
Years of schooling	333,871	10.471	4.093	0	27
age	333,871	34.759	12.205	10	65
Self-employed	333,871	0.246	0.431	0	1
Log Wage	160,683	4.204	0.681	-1.949	8.362
Daily wage (NIS)	160,972	79.878	56.049	0	65
Year	333,871	-	-	1999	2018

† Northern districts include: Jenin, Tubas, Tulkarem, Nablus, Qalqilia and Salfit.

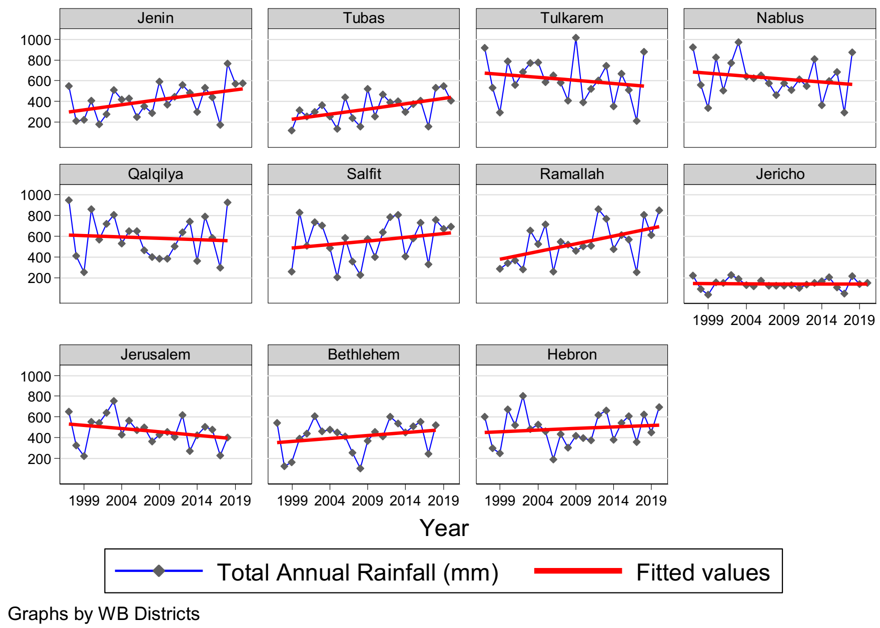
Figure 2 shows a discernible pattern of considerable variability in annual rainfall quantities across different districts throughout the years. This variation encompasses periods of drought contrasted with more favorable climatic conditions. Interestingly, regions where agriculture constitutes a predominant economic activity—such as the northern cities including Tubas, Jenin, and Salfit—exhibit more pronounced fluctuations in rainfall levels. It is noteworthy that Palestine has experienced an increase in extreme weather events, mainly droughts, in recent decades, particularly in the southern and eastern slopes (ARIJ 2012). These adverse meteorological conditions have had adverse consequences on agriculture and food security in the region. Projections based on recent assessments suggest a potential 30 percent reduction in average annual precipitation by the end of this century when compared to the period from 1961 to 1990 (Tippmann and Baroni 2017). Annual precipitation in Figure 2 is presented in millimeters per year (mm/year) and ranges from a minimum of 36 to a maximum of 1,013 mm/year. Surface temperature is expressed in degrees Celsius (°C). Furthermore, the average annual maximum surface temperatures span from 19.97 to 33.2°C, while the average annual minimum surface temperatures vary between 12.2 and 20.2°C.

Figure 1: Share of Workers in Agriculture Sector per West Bank Districts Over the period 1999–2018



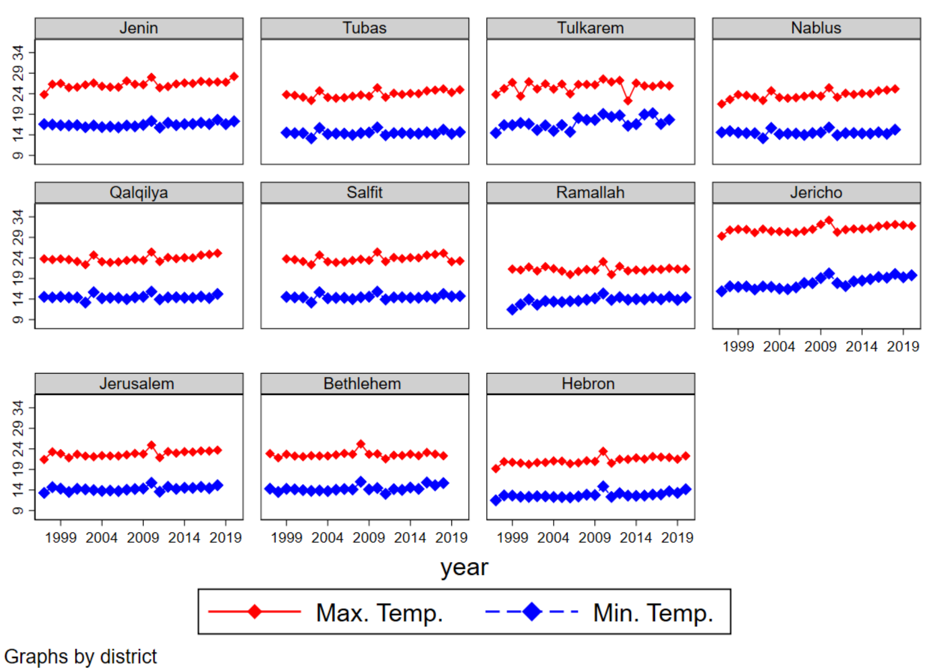
Source: Own calculation based on LFS 1999–2018. The percentage does not include Palestinian workers who work in the Israeli labor market.

Figure 2: Total Annual Rainfall in (mm) per West Bank Districts Over the period 1999–2018



Source: Own calculations based on Palestinian Meteorological Department data.

Figure 3: Average Annual Maximum and Minimum Temperature per West Bank Districts Over the Period 1999–2018



Source: Own calculations based on Palestinian Meteorological Department data.

The main analysis focuses on the variation in climate change indicators across 11 districts in the West Bank over a period of 20 years. This data provides insights into the effects of climate change on the region. To analyze these effects, the study employs standardized values of the climate change indicators, as detailed in the subsequent section on the identification strategy. Our analysis includes several control variables at the individual level including gender, where the sample utilized in our study comprises 78 percent male observations. Within this analysis, the mean educational attainment stands at 10.4 years while the average age is 35. Self-employment constitutes 25 percent of the employed sample.

4. IDENTIFICATION STRATEGY

In this section, we outline the empirical model used to investigate the relationship between climate change indicators—specifically annual rainfall data and maximum and minimum annual temperature—and the likelihood of Palestinian workers in the West Bank districts remaining in the agriculture sector. Our analysis focuses on the short-term impact of rainfall fluctuations within the preceding one or two years of the study period (lagged effect). To assess the effect of rainfall/temperature deviation in previous periods on an individual's probability of working in the agriculture sector, we estimate the following linear probability model:

$$(Working\ in\ Agriculture)_{ijt} = \alpha_0 + b_1 R_{j(t-1)} + b_2 R_{j(t-2)} + b_3 T_{j(t-1)} + b_4 T_{j(t-2)} + \gamma X_{ijt} + d_j + q_t + \quad (1)$$

Where, $(Working\ in\ Agriculture)_{ijt}$ represents the outcome variable and takes a value of one if individual which, residing in district *j*, is working in the agriculture sector in year *t*, and takes the value of zero otherwise. $R_{j(t-1)}$ and $R_{j(t-2)}$ are the variables of interest, representing the total precipitation measured in millimeters in the preceding one or two years, respectively, in year *t* for district *j*. T_{jt} indicates the average temperature measured in degrees Celsius (°C) in year *t* for district *j*. The coefficients b_1, b_2, b_3 and b_4 measure the effect of one standard deviation increase/decrease in the climate change indicators on the likelihood of individuals engaging in agricultural activities. Following the literature (see for example Marchetta et al. 2019), the negative influence of climate change, rainfall, and temperature in the current study, deviates from the historical local trend below/above zero, respectively, which can lead to drought conditions. Figure A.1, in the appendix, shows the trend of the standardized rainfall deviation between 1999 and 2018 in the West Bank districts, which ranges between –2.14 and 2.29 relative to the average for the entire period. The temperature deviation also shows a higher variation ranging between –2.280 and 3.82 for the maximum temperature and between –2.89 and 3.01 for the minimum temperature, as presented in Figures A.2 and A.3 respectively.

X_{ijt} captures individual-level control variables including gender, years of education, age, age squared, and self-employment status. The economic pattern shows significant variation among the West Bank districts. Also, the study period (1999–2018) is characterized by numerous dramatic events, particularly during and after the second Intifada (2000–05), which resulted in significant structural changes in the Palestinian economy. The model includes d_j—a vector of district-fixed effects—to account for time-invariant and other unobserved factors that may be correlated with climate changes or economic structural changes. The term q_t is a vector of year fixed effects that captures changes over time. Finally, εijt represents the idiosyncratic error term. All results are obtained with the robust standard errors.

Due to the geographical variation in the West Bank and significant climate change fluctuations across the districts during the study period, our analysis first presents the impact of climate change indicators on all West Bank regions, followed by the effect of precipitation and temperature fluctuations for each region as follows: Jericho, the northern districts (Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit), and Hebron. The motive for focusing on those three regions is that agriculture employs a considerable number of people in these districts, as opposed to Ramallah, Jerusalem, and Bethlehem, where agriculture is essentially non-existent. Second, each of the three districts has distinct features in terms of primary agricultural operations, primary economic activities, and primary source of irrigation. According to PCBS's Agriculture Statistics Report (2011), three major agricultural norms in the Palestinian territories are distributed variably across the West Bank region. According to Table B.2 in the appendix, Horticulture Trees account for 61 percent of the cultivated land for agricultural operations in the West Bank, followed by field crops (27 percent), and vegetables (12 percent). Horticulture tree cultivation is the most common agricultural activity in the northern districts (61 percent), whereas vegetable cultivation is the most common agriculture activity in the Jericho districts (72 percent). In Hebron, both field crops and horticulture tree cultivation are the dominant agricultural norms (50 percent and 45 percent, respectively).

These three main agricultural zones on the West Bank differ not just in terms of agricultural dominant norms, but also in terms of primary source of irrigation. Rainfall accounts for roughly 85 percent of the primary source of irrigation for agricultural plants in the northern districts and Hebron. Non-rainfall irrigation methods such as artesian wells, streams, valleys, drilled wells, and tanks are the primary sources of agricultural properties in the Jericho area, as shown in Table B.3 in the appendix.

One concern with our identification strategy is whether there is a systematic correlation between rainfall and temperature variation with other unobserved district or location characteristics that might influence the individual decision to engage in agricultural activity or encourage internal migration across districts. To mitigate this concern, our analysis uses deviation from historical climate change indicators within districts, not relative to other districts. Furthermore, most internal resident migration occurs within the same governorate (PCBS 2010). The main assumption of this model is that the impact of climate change, measured by the annual variation of precipitation and temperature, is primarily exogenous and random, and does not necessarily correlate with any unobserved factors. Further, the model incorporates several individual-level controls that influence individual economic patterns, along with the inclusion of district and year-fixed effects. Thus, this model allows us to assume a causal interpretation of the short-term effect of climate change indicators on the reallocation of economic activity from agriculture to other sectors.

5. RESULTS

5.1 Main Results (The Effect of Climate Change on Labor Force Allocation)

Tables 2 and 3 present the primary findings of this study. First, Table 2 provides separate estimations for the impact of annual variations in total precipitation, measured in millimeters (columns 1 through 4), and temperatures, measured in degrees Celsius (°C) (columns 5 through 8), on the labor supply within the agriculture sector in the subsequent year or two years. It is essential to consider that the West Bank region exhibits significant heterogeneity in terms of its primary agricultural patterns, rainfall levels, temperature variations, as well as the distribution and recharge of its primary aquifers. Therefore, our analysis initially addresses the overarching effect on the entire West Bank and subsequently delves into specific regions, namely Jericho, northern districts, and Hebron, in that order. All estimations control for year-fixed effects, district-fixed effects (applied when conducting regressions across the entire West Bank and northern districts), and individual-level variables as outlined in equation (1).

The first column in Table 2 reveals a positive association between rainfall and the supply of labor in the agriculture sector. Specifically, a one standard deviation increase in precipitation in the previous year, or two years prior, is associated with an increased likelihood of individuals being employed in the agriculture sector by 0.3 percent and 0.2 percent, respectively. However, the magnitude of this effect varies across the West Bank districts. In Jericho, the coefficients exhibit opposing trends, with similar magnitudes observed in the two years preceding the year of interest. Nevertheless, the coefficient sign differs, being positive in year -1 and negative in year 2. This phenomenon can be attributed to several factors. Firstly, in Jericho, the majority of irrigation does not rely on rainfall, as indicated in Table B.3 in the appendix; instead, primary sources of irrigation include wells, streams, valleys, dug wells, and water tanks. Decreased rainfall significantly impacts the groundwater aquifer recharge rate which serves as the primary water source for Jericho (Tippmann and Baroni 2016). Secondly, vegetable cultivation dominates agricultural activities in Jericho, accounting for 72 percent of cultivated areas (Table B.2 in the appendix). Artificial irrigation methods such as drip and sprinkler irrigation are the primary means of irrigation for these cultivated areas (Table B.5 in the appendix).

Next, in column 3, it is demonstrated that an increase in precipitation over the preceding two years exhibits a positive correlation solely with the likelihood of workers engaging in the agricultural sector. This observation suggests a reluctance among farmers to alter their main occupation. Figure 1 shows that certain districts, such as Nablus and Tubas, experience a slow pattern of change in the annual share of agricultural laborers compared with other districts. It is also worth noting that access to the Israeli labor market may be difficult for workers experiencing agricultural losses due to weather shocks. For instance, when examining the respective districts of Nablus, Tulkarem, and Tubas, it becomes evident that they possess the lowest proportion of workers participating in the Israeli labor market, as illustrated in Figure A.5 in the appendix.

Furthermore, since horticulture, encompassing fruits and field crops, constitutes the main agricultural activity in the northern districts, as indicated in Table B.2 in the appendix, the estimated monetary losses attributable to drought and frost resulting from reduced rainfall are comparatively lower when contrasted with other primary rain-dependent crops in the West Bank (Tippmann and Baroni 2016).[17] This may also contribute to the delayed decision making of farmers to remain engaged in the agricultural sector in subsequent years. The effect of rainfall on the agricultural sector in the Hebron district is presented in column 4. The coefficient in question represents the immediate short-term positive effect of one standard deviation increase in precipitation on the probability of workers remaining within the agricultural sector in the following year. This result is consistent with the fact that horticulture, particularly grape cultivation, constitutes the primary agricultural activity in Hebron, alongside field crops (see Table B.2 in the appendix). Over 95 percent of these two important agricultural products in Hebron are rain-fed crops (see Tables B.4 and B.6 in the appendix). Grapes, in particular, exhibit high susceptibility to climate fluctuations, putting them among the most vulnerable crops (Smithers et al. 2016).

Columns 5 through 8 in Table 2 present the effect of temperature variations on labor supply decisions within the agricultural sector. The effects of maximum and minimum temperatures in the previous year or two years yield mixed findings across West Bank districts. Temperature changes primarily affect agricultural production by altering the duration of physiological processes in plants, potentially diminishing yields, impeding the nutritional processes of fruits and vegetables, and intensifying the prevalence of diseases and pests (Tippmann and Baroni

[17] According to the Palestinian Environmental Quality Authority Report (2016), the estimated loss in agricultural season 2007/2008 in rain-fed crops due to drought and frost was the highest in olives crops ($60.7 million) followed by grape crops ($14.1 million), then fruits ($10.7 million), and finally, wheat and fodder crops, ($6.9 million and $4.5 million respectively). For further details see (Tippmann and Baroni 2016, 17).

2016). In a broader context, across the entire West Bank region, an increase in temperature manifests a significant positive influence on labor supply within the agricultural sector, but only after a two-year interval. Conversely, an increase in minimum temperature in the previous year has a positive impact on the likelihood of workers participating in the agricultural sector during the subsequent period. Nevertheless, the short-term effect of an increased maximum temperature is significant and heterogeneous within West Bank districts.

In the case of Jericho, where citrus cultivation[18] is predominant, high temperatures are positively associated with labor supply in the agricultural sector during the previous year (n–1) and the previous two years (n–2). Conversely, an increase in minimum temperature induces a significant reduction in the probability of workers remaining within the agricultural sector in Jericho. In the northern districts and Hebron, a one standard deviation increase in temperature corresponds to a decrease in the likelihood of workers participating in the agricultural sector by 1 percent and 0.8 percent respectively. These findings align with the detrimental influence of elevated temperatures on agricultural production. Moreover, in Hebron, a one standard deviation increase in minimum temperature correlates with an increased probability of workers engaging in the agricultural sector. One plausible explanation for these results is the prevalence of fruits and vegetables as the main agricultural products in the Hebron region, which are particularly sensitive to frost events. For instance, in 2015, frost resulted in the destruction of 170 hectares of farmland in Hebron (Smithers et al. 2016).

In terms of the coefficient size, it is noteworthy that a one standard deviation increase in either maximum or minimum temperature wields a more substantial influence on the likelihood of employment within the agricultural sector than a comparable increase in rainfall. Additionally, it is important to note that other factors, such as the number of rainy days and the temporal distribution of rainfall throughout the season, can exert considerable influence on rain-dependent agriculture and other livelihoods, thereby playing a significant role in farmers' decision-making processes. Furthermore, an increase in temperature could be accompanied by decreased precipitation, which, in turn, affects the volume of water required for irrigation (Mimi and Jamous 2010). Projections anticipate a reduction of 10 percent to 20 percent in irrigation water

[18] Citrus is a tropical and subtropical crop, and can grow in high-temperature zones (Abobatta 2019).

demand with temperature variations of +1°C, +2°C, and +3°C (Mimi and Jamous 2010). A separate study by Mizyed (2009) finds that a 6°C temperature rise would necessitate a 17 percent increase in agricultural water demand in the West Bank due to heightened evapotranspiration.

Table 2: **The Effect of Climate Change Indicators on the Probability of Working in Agriculture Sector**

Dep. Var: Probability of Working in Agriculture Sector	Rainfall Only				Temp. Only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All WB	Jericho	Northern Districts†	Hebron	All WB	Jericho	Northern Districts†	Hebron
Total Rainfall SV_{-1}	**.003*** **	**.014** **	0.001	**0.0183*** **				
	(0.001)	**(0.006)**	(0.002)	**(0.00209)**				
Total Rainfall SV_{-2}	**.002*** **	**-.013* **	**.008*** **	-0.00545				
	(0.001)	**(0.007)**	**(0.002)**	(0.00340)				
Max. Temp. SV_{-1}					-0.001	**.107*** **	**-.01*** **	**-0.0860*** **
					(0.001)	**(0.016)**	(0.002)	**(0.00981)**
Max. Temp. SV_{-2}					**.004*** **	**.088*** **	**.005** **	0.00468
					(0.001)	**(0.014)**	(0.002)	(0.00620)
Min. Temp. SV_{-1}					**.006*** **	**-.136*** **	0.002	**0.0864*** **
					(0.001)	**(0.026)**	(0.002)	**(0.00831)**
Min. Temp. SV_{-2}					0.00	**-.071*** **	**-.011*** **	0.000709
					(0.001)	**(0.016)**	(0.002)	(0.00565)
Observations	333,871	16,663	159,078	68,533	333,871	16,663	159,078	68,533
R-squared	0.166	0.206	0.188	0.237	0.204	0.206	0.188	0.237
Mean dependent var	0.16	0.33	0.2	0.177	0.15	0.33	0.2	0.177
SD dependent var	0.36	0.47	0.4	0.381	0.36	0.47	0.4	0.381
Controls*	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
District Fixed Effect	YES	NO	YES	NO	YES	NO	YES	NO

Robust Standard errors are in parentheses
*Controls include worker gender, age, age squared, schooling, and an indicator for self-employment. Climate change indicators standardized values for rainfall, maximum and minimum temperature in the same year)
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<.01, ** p<.05, * p<.1

Table 3 presents the results when employing a model that includes all climate change indicators in the same equation. The effects are presented for the entire West Bank region in column 1. The results reveal that an increase in rainfall in the preceding year, equivalent to one standard deviation, corresponds to a decreased probability of employment within the agricultural sector. The magnitude of this coefficient is akin to that of an increase in minimum temperature in the preceding year. Nonetheless, the latter exerts a positively significant effect, potentially offsetting the negative impact of changes in precipitation. The results from Table 3 mirror the patterns observed for rainfall and variations in maximum/minimum temperatures across the West Bank districts of Hebron, Jericho, and the northern districts. In sum, the likelihood of agricultural employment exhibits a positive and negative relationship with increasing rainfall and maximum temperature respectively.

In addition to the inclusion of year- and district-fixed effects in all estimations, Table 3 shows the influence of observed labor characteristics on their re/allocation to the agricultural sector. Gender emerges as a prominent explanatory factor, favoring males in the decision to pursue agricultural work. Moreover, due to structural shifts in the Palestinian economy, particularly following the establishment of the Palestinian authority (Angrist 1996), individuals with higher levels of education tend to gravitate toward sectors other than agriculture, especially the service sector. Additionally, as agriculture in the Palestinian territories often relies on traditional cultivation techniques and conventional farming practices (Kashiwagi and Kamiyama 2023), the likelihood of engagement in the agricultural sector diminishes with advancing age, partly attributed to the physical demands associated with agricultural work, which tend to decline with age. The age effect may also be indicative of its impact on self-employment. Thus, self-employment exerts a consistently positive effect across all West Bank regions on the probability of engaging in the agricultural sector. Furthermore, within the Palestinian labor market, a significant correlation exists between parental occupation and the occupational choices of their offspring (Daoud and Fallah 2014). This may explain why the younger generation often takes the responsibility for farming and other agricultural activities, leading to a reduced likelihood of individuals engaging in farming as they age.

Table 3: The Effect of Climate Change Indicators on the Probability of Working in Agriculture Sector

Dep. Var: Probability of Working in Agriculture Sector	(1) All WB	(2) Jericho	(3) Northern Districts †	(4) Hebron
Total Rainfall SV-1	**-.005*** **	**.042*** **	-0.001	0.000363
	(0.001)	**(0.008)**	(0.002)	(0.00261)
Total Rainfall SV-2	0.001	**-.02*** **	**.009*** **	**0.0111*** **
	(0.001)	**(0.007)**	**(0.002)**	**(0.00251)**
Max. Temp. SV-1	-0.002	0.005	**-.01*** **	**-0.0571*** **
	(0.001)	(0.006)	**(0.002)**	**(0.00488)**
Max. Temp. SV-2	**.002** **	0.007	**.005** **	-
	(0.001)	(0.014)	**(0.002)**	
Min. Temp. SV-1	**.005*** **		0.001	0.000943
	(0.001)		(0.002)	(0.00178)
Min. Temp. SV-2	0.00	0.016	**-.011*** **	**-0.0242*** **
	(0.001)	(0.018)	**(0.002)**	**(0.00441)**
Male worker	-.181***	-.121***	-.188***	-0.262***
	(0.002)	(0.007)	(0.002)	(0.00362)
Years of schooling	-.023***	-.04***	-.025***	-0.0237***
	(0.000)	(0.001)	(0.000)	(0.000321)
Age	-.027***	-.037***	-.027***	-0.0358***
	(0.001)	(0.002)	(0.001)	(0.000680)
Age_Squared	0***	0***	0***	0.000489***
	(0.000)	(0.000)	(0.000)	(9.42e-06)
Self-employed	.067***	.081***	.101***	0.0203***
	(0.00)	(0.01)	(0.00)	(0.00318)
Observations	333,871	16,663	159,078	68,533
R-squared	0.21	0.21	0.19	0.237
Mean dependent var	0.17	0.33	0.2	0.177
SD dependent var	0.6	0.47	0.41	0.381
Year Fixed Effect	YES	YES	YES	YES
District Fixed	YES	NO	YES	NO

Robust Standard errors are in parentheses
Controls include worker gender, age, age squared, schooling, and an indicator for self-employment.
Climate change indicators standardized values for rainfall, maximum and minimum temperature in the same year)
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<.01, ** p<.05, * p<.1

5.2 Additional Results (The Effect of Climate Change on Labor Not in the Labor Force)

The results presented in Table A.1 (Panel A) focus on people who are not part of the formal workforce[19] and control for age as a factor in the analysis. In all of West Bank, the results suggest that, as annual rainfall levels decrease, the probability of individuals who are currently not part of the workforce getting involved in the agriculture sector increases (the previous year's rainfall has no effect). This finding aligns with the intuition that excessive rainfall might render alternative economic opportunities more appealing, diminishing the allure of agricultural work. In Jericho, however, when examining the effect of rainfall in the previous two years, the coefficient is positive and statistically significant. This finding implies that in Jericho higher rainfall in the previous two years is associated with a greater likelihood of individuals outside the labor force opting to engage in agriculture. In northern districts, on the other hand, the coefficients were not statistically significant. Moving on to Hebron, total rainfall in the previous year is statistically significant. This implies that increased rainfall in the previous year is associated with a lower likelihood of individuals in Hebron engaging in agriculture, suggesting that recent rainfall levels negatively impact agricultural labor participation in this district. However, the total rainfall in the previous two years is positive and significant; indicating a substituting effect.

The presented results in Panel B across all West Bank districts reveal that temperature variables, particularly minimum and maximum temperatures from the previous year, significantly influence the probability of individuals currently outside the labor force entering the agriculture sector. A negative and highly significant relationship exists between a previous-year increase in maximum temperatures and the likelihood of individuals entering agriculture. In contrast, an increase in minimum temperatures from the previous year corresponds to a higher probability of engagement in the agriculture sector, indicating a positive and significant relationship. Whereas the results show no significance of temperature in the Jericho district. In the northern districts, the results reveal significant relationships between temperature variables and the probability of individuals not currently in the labor force entering the agriculture sector. Higher maximum temperatures from the previous year are associated with a reduced likelihood of individuals

[19] Table A.2 in the appendix provides a comprehensive presentation of the observed characteristics of individuals who are not in the labor force.

engaging in agriculture, while increased minimum temperatures from the previous year correspond to a higher probability of entering the agricultural sector. However, the effects of temperature from two years ago are less favorable and may discourage individuals from participating in agriculture. In the Hebron district, the results reveal significant relationships between temperature variables and the probability of entering the agriculture sector for individuals currently outside the labor force or not actively working. Higher maximum temperatures from the previous year are associated with a reduced likelihood of individuals engaging in agriculture, while increased maximum temperatures from two years ago correspond to a higher probability of entering the agricultural sector. Additionally, higher minimum temperatures from the previous year and lower minimum temperatures from two years ago are both linked to an increased likelihood of individuals participating in agriculture.

6. MECHANISM

In this section, we explore two potential additional results[20] that might serve as mechanisms through which the preceding period's increase in precipitation and rising temperatures may affect labor decisions regarding the retention of or exit from the agricultural sector in the West Bank. The participation of Palestinian workers in the Israeli labor market constitutes a significant income source for numerous Palestinian families, particularly in the West Bank. Recent data from the PCBS in 2022 reveal that 29 percent of salaried workers in the West Bank are employed in the Israeli labor market. In our sample, the share of Palestinian workers from the West Bank working in Israel is 15.73 percent, and among them, 12.53 percent work in agriculture. The agricultural sector ranks as the third-largest sector in terms of Palestinian workers in Israel representation, following construction (56.76 percent) and manufacturing (13.19 percent).

Israel is a substantial contributor to its own domestic food supply. The agricultural landscape in Israel is predominantly characterized by an intensive cultivation system, complemented by

[20] The main results presented in this analysis do not account for work in Israel. However, it is important to acknowledge that work in Israel, particularly in the agricultural sector, can serve as a significant mechanism that influences the labor dynamics within the West Bank.

expansive rain-fed cultivation methods applied to olives, wheat, and barley particularly in the arid southern territories. A noteworthy achievement in recent years pertains to the prudent utilization of water resources, resulting in a substantial reduction in average water consumption per hectare (Elagraa and Elkhafif 2015). This reduction is evidenced by a decline from 8,000 cubic meters per hectare fifty years ago to the current rate of 5,000 cubic meters per hectare. The impressive twelvefold growth in agricultural output since the year 1948 can be attributed to substantial advancements and pioneering innovations within the agricultural domain. Remarkably, this augmentation in productivity has transpired while maintaining a relatively modest trajectory of water utilization, which has undergone a threefold increase over the same historical timeframe (ibid.).

It is pertinent to note that the Israeli economy exhibits a greater capacity to address the challenges posed by drought and climate change in comparison to that of Palestine. Israeli farmers have demonstrated adaptability through the adoption of innovative irrigation techniques, including drip irrigation and cover technology (Fleischer et al. 2008). Furthermore, Israel has effectively supplied water to the agricultural sector, leading to a significant increase in output per unit of water over the past three decades (Feitelson 2013). Table A.3 in the appendix presents the observed characteristics of workers in the agriculture sector as well the share of those employed in the Israeli agriculture-sector labor market. Table 4 presents the effects of climate change indicators on the likelihood of Palestinian workers engaging in the Israeli agricultural labor market. It is important to clarify that the analysis in Table 4 is restricted to workers within the agriculture sector, irrespective of whether they are employed in the Israeli or the local market. The outcome variable takes the value of one if worker i—operating in the agriculture sector within district j—is employed in the Israeli agricultural sector in year t, and takes the value of zero otherwise. An increase in rainfall during the preceding one or two years is significantly associated with a decreased likelihood of Palestinian workers seeking employment in Israel. These findings are consistent with the primary analysis, underlining the prevalence of rainfed agriculture in Palestine. The migration of Palestinian agricultural laborers to the Israeli labor market, rather than the local market, is also negatively associated with rising temperatures. Nevertheless, it is noteworthy that the coefficient magnitude for temperature is considerably smaller than that of precipitation, and its level of statistical significance is comparatively lower.

Table 4: The Effect of Climate Change Indicators on the probability of Working in The Israeli Agriculture Sector

Dep.Var. Working in Agriculture in Isreal labor market	(1) All WB	(2) Jericho	(3) Northern Districts	(4) Hebron
Total Rainfall SV-1	**-.009*** **	**-.041*** **	**-.015*** **	**-0.0266*** **
	(0.002)	**(0.014)**	**(0.003)**	**(0.00650)**
Total Rainfall SV-2	**-.007*** **	0.009	**-.009*** **	**-0.0190*** **
	(0.002)	(0.011)	**(0.003)**	**(0.00557)**
Max. Temp. SV-1	-.005*	-.013*	**-.006***	**-**
	(0.002)	(0.008)	**(0.004)**	
Max. Temp. SV-2	0.004	-0.004	**-0.005**	**-0.0821*** **
	(0.003)	(0.021)	**(0.004)**	**(0.0155)**
Min. Temp. SV-1	0.004		**-.009** **	**-0.0246*** **
	(0.003)		**(0.004)**	**(0.00374)**
Min. Temp. SV-2	.005*	0.025	0	**0.0573*** **
	(0.003)	(0.028)	(0.003)	**(0.0125)**
Observations	65,213	8,021	36,952	13,455
R-squared	0.186	0.162	0.165	0.189
Mean dependent var	0.123	0.103	0.31	0.1
SD dependent var	0.329	0.304	0.11	0.3
Year Fixed Effect	YES	YES	YES	YES
District Fixed	YES	YES	YES	YES

Robust Standard errors are in parentheses.
Controls include worker gender, age, age squared, schooling, and an indicator for self-employment.
Climate change indicators standardized values for rainfall,maximum and minimum temperature in the same year)
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<.01, ** p<.05, * p<.1

The proposed second mechanism influencing the sectoral reallocation of labor pertains to the effect of climate change shocks on workers' wages, particularly those employed within the agricultural sector. Employing the following regression form, we seek to estimate the effects of annual fluctuations in climate indicators on wage:

$$Ln(Wage)_{ijt} = \gamma_0 + \gamma_1 R_{jt} + \gamma_2 Rj_{(t-1)} + \gamma_3 R_{(t-2)} + \beta_1 (Max.T)jt + \beta 2\ (Max.\ T)_{jt-1} + \beta_3\ (Max.\ T)_{jt-2} +$$

$$\beta_4 (Min.T)jt + \beta_5\ (Min.\ T)_{jt-1} + \beta_6\ (Min.\ T)_{jt-2} + a\ X_{ijt} + d_j + q_t + u_{ijt} \quad (2)$$

Where the outcome is the natural log for worker *i*, living in district *j* in year *t*. Notably, the model captures the effect of rainfall and temperature changes in the same year, in addition to the effect of the previous period. The motivation for including the same year for the rainfall and temperature coefficients is the assumption that increasing temperature combined with decreasing rainfall negatively affect agricultural productivity (Liu et al. 2023). In addition, an increase in temperature may lead to a decrease in wages and employment outside of the agricultural sector, which could affect the demand for agricultural products and thus negatively affect income in the agricultural sector (Jessoe et al. 2018). The other terms have the same definition as in equation (1).

The results presented in Table 5 show that in the context of Jericho and the northern districts, where a significant portion of the labor force is engaged in the agricultural sector, an increase in current-year rainfall exerts a positive effect on the augmentation of workers' wages. Specifically, an increase of current-year rainfall by one standard deviation is associated with an increase of 4.3 percent and 9.5 percent in daily wages for Jericho and the northern districts, respectively. The effect of an average annual temperature increase on wages is also found to have an effect in different ways. In Jericho, an increase in maximum temperature is observed to have a negative, effect (statistically significant at the 10 percent level) on workers' wages. Conversely, an increase in the average minimum temperature within the current year is found to exhibit a positively correlated relationship with wages, characterized by more coefficient precision and a more substantial magnitude of effect. A one standard deviation increase in the current year's average minimum temperature is associated with an 11 percent increase in the wages of agricultural workers in Jericho. A similar directional effect is discerned in the northern districts for the minimum temperature in the current year, but with a smaller coefficient magnitude and a reduced level of statistical precision.

Next, we find a contrasting trend in the impact of current-year variations in average maximum and minimum temperatures on wages within the Hebron districts, as compared to the findings in Jericho. Specifically, we observe a positive correlation between an increase in the maximum temperature and an increase in wages, while conversely, an increase in the minimum temperature is associated with a negative effect on workers' wages. This observed divergence may be attributed to different agricultural practices in Hebron than in other districts in Palestine, characterized by the predominant cultivation of horticultural trees and field crops; these particular crops are highly susceptible to temperature fluctuations. Another noteworthy aspect of Hebron is the limited sample size of individuals who reported their salaries, consisting of only 371 observations spanning a period of 20 years, which affects the possibility of generalizing the Table 5 results in column 4 in particular.

Overall, these findings offer empirical support for the notion that the relationship between annual fluctuations in rainfall and temperature and the likelihood of individuals engaging in agricultural work may be influenced by climate change indicators (specifically rainfall and temperature). This influence manifests in two ways: firstly, by affecting the likelihood of agricultural workers remaining in the agricultural sector within the Israeli labor market rather than seeking opportunities elsewhere; and secondly, by directly impacting the earnings of these workers.

Table 5: The Effect of Climate Change Indicators on Wages

Dep. Variable: Log Wage	(1) All WB	(2) Jericho	(3) Northern Districts†	(4) Hebron
Total Rainfall SV	0.031	**.043*** **	**.095** **	0.0324
	(0.021)	**(0.015)**	**(0.038)**	(0.0459)
Total Rainfall SV_{-1}	-0.002	-0.023	0	-0.0206
	(0.013)	(0.015)	(0.018)	(0.0593)
Total Rainfall SV_{-2}	0.002	0.034	**-.044** **	-0.0452
	(0.010)	(0.023)	**(0.018)**	(0.0666)
Max. Temp. SV	-0.013	**-.052***	-0.038	**0.247** **
	(0.020)	**(0.028)**	(0.030)	**(0.101)**
Max. Temp. SV_{-1}	0.003	-0.009	-0.007	-
	(0.013)	(0.016)	(0.014)	
Max. Temp. SV_{-2}	-0.019	0.039	**-.048** **	-0.0476
	(0.017)	(0.028)	**(0.024)**	(0.0966)
Min. Temp. SV	0.021	**.111** **	**.032***	**-0.186***
	(0.013)	**(0.044)**	**(0.017)**	**(0.112)**
Min. Temp. SV_{-1}	**-.024***		**-.048** **	0.0358
	(0.013)		**(0.019)**	(0.0347)
Min. Temp. SV_{-2}	-0.014	-0.035	-0.025	0.0782
	(0.018)	(0.038)	(0.030)	(0.0791)
Observations	5174	1326	3172	371
R-squared	0.316	0.265	0.359	0.317
Controls	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES
District Fixed	YES	NO	YES	NO

Robust Standard errors are in parentheses
Controls include worker gender, age, age squared, schooling, and an indicator for self-employment.
Climate change indicators standardized values for rainfall, maximum and minimum temperature in the same year)
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<.01, ** p<.05, * p<.1

7. ROBUSTNESS CHECKS

The final empirical results of our study demonstrate the influence of climate shocks on sectoral reallocation, mirroring the main results presented in Table 3, subsequent to the inclusion of the log wage coefficient into the model. Prior to discussing the obtained results, it is crucial to highlight that the number of observations has been lowered by around 50 percent, specifically from 333,871 to 160,683. It is also important to highlight that, apart from the case of Jericho, where the proportion of workers in the agricultural sector constitutes 15 percent of the overall observations, the proportion of workers in agriculture experiences a substantial decline from 17 percent in the main analysis (Tables 2 and 3) to 3.3 percent. As mentioned in the data section, the decline in the proportion of workers can be attributed to the inclusion of wages in the model. This decline is primarily due to the fact that 98 percent of individuals engaged in agricultural activities either own and manage their agricultural properties or have a family member managing the work. Consequently, these individuals did not report their wages in the Labor Force Survey (LFS). However, even after the loss of a substantial number of observations, the time series data still provide a large number of observations for the execution of the regression. The results presented in Table 6 indicate a statistically significant correlation between the annual rainfall levels and the likelihood of individuals being employed in the agriculture sector across all estimations, except for in the case of Jericho, where the observed relationship is negative and statistically significant at a 10 percent level. One possible explanation for this negative relationship can be attributed to the fact that agricultural practices in Jericho exhibit a very low reliance on rainfall as a primary source of irrigation for sustaining crop cultivation. Conversely, wells, streams, and valleys serve as the primary means of irrigation in that region (See Table B. 3 in the Appendix).

The significance of the previous year's average maximum temperature is observed solely when the estimation encompasses the entirety of the West Bank region. However, this effect becomes non-existent when examining each district individually. In contrast, the impact of the previous two years' average maximum temperature exhibits a positive correlation, particularly in Jericho, with the probability of engaging in the agricultural sector. The effect of an increase in the average minimum temperature in the preceding year aligns with the findings presented in Table 2, particularly in light of the region's distinct agricultural practices, especially in Hebron, where the cultivation of vegetables[21] and fruits predominates.

[21] These crops are highly sensitive to frost (Smithers et al. 2016).

The negative correlation observed between the wage coefficient and labor supply within the agricultural sector can be attributed to the economic structure in Palestine, where the services sector holds dominance. Additionally, it reflects a phenomenon wherein individuals with higher levels of education and comparatively higher earnings tend to seek employment opportunities beyond the agricultural sector, as discussed in the previous section.

To ensure the retention of a substantial number of observations, we opted to not include daily wage data in our primary model; in the West Bank, the vast majority, specifically 98 percent, of agricultural holdings are either managed by the owner directly (72 percent) or by a member of the owner's family (26 percent), as reported by the PCBS Agricultural Statistics Survey in 2011. When introducing wage controls into our study, this high percentage of non-waged agricultural holdings (98 percent) explains the substantial and sharp decline in the proportion of workers within the agricultural sector. For detailed information (refer to Table B.1 in the appendix). Particularly, when wages are factored into our model, the volume of available data decreases by 48 percent, reducing the number of observations from 333,871 to 160,972. Additionally, the share of workers engaged in the agricultural sector also diminishes significantly, dropping from 17 to 3 percent. However, we show the effect of climate change on sectoral reallocation in a separate model after controlling for workers' wages (Table 6).

Table 6: The Effect of Climate Change Indicators on the Probability of Working in Agriculture Sector (Control for wages)

	(1)	(2)	(3)	(4)
Dep. Var: Probability of Working in Agriculture Sector	All WB	Jericho	Northern districts	Hebron
Total Rainfall SV_{-1}	.002***	-.014*	.005***	-0.000384
	(0.001)	(0.007)	(0.002)	(0.000855)
Total Rainfall SV_{-2}	.003***	0.014	.003*	0.00235**
	(0.001)	(0.009)	(0.002)	(0.000994)
Max. Temp. SV_{-1}	.002**	-0.005	0.002	-0.00177
	(0.001)	(0.007)	(0.002)	(0.00246)
Max. Temp. SV_{-2}	.003***	.1***	.007***	-
	(0.001)	(0.024)	(0.002)	
Min. Temp. SV_{-1}	0		.005**	0.00552**
	(0.001)		(0.002)	(0.00259)
Min. Temp. SV_{-2}	-0.001	-.076***	-0.001	0.00222**
	(0.001)	(0.028)	(0.002)	(0.000885)
LogWage	-.006***	-.026***	-.01***	-0.000366
	(0.001)	(0.008)	(0.001)	(0.00118)
Observations	160683	8784	74199	29,471
R-squared	0.077	0.117	0.066	0.012
Mean dependent var	0.032	0.15	0.035	0.013
SD dependent var	0.177	0.35	0.18	0.111
Controls	YES	YES	YES	YES
Wage of workers	YES	YES	YES	YES
Year Fixed Effect	YES	NO	YES	NO
District Fixed	YES	YES	YES	YES

Robust Standard errors are in parentheses.
*Controls include worker gender, age, age squared, schooling, and an indicator for self-employment.
Climate change indicators standardized values for rainfall, maximum and minimum temperature in the same year)
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<.01, ** p<.05, * p<.1

We run the regression at the district level in the second set of robustness checks. The outcome variable in the first two columns of Table 7 is the total number of agricultural workers in each district over the period (1998–2018) in the entire West Bank and northern districts separately. The analysis shows that the number of workers in the agriculture sector in the northern districts is significantly reduced by 52.31 people for every one standard deviation increase in the maximum temperature in the previous two years. These results are also consistent with the findings in columns 3 and 4 of Table 7, where the outcome variable is the share of workers in the agricultural sector. The only significant climate indicator that significantly affects the share of workers in agriculture per district is the maximum temperature. The effect is negative whether in the preceding one or two years. This, in turn, is consistent with findings from most major analyses, which indicate a negative role for rising temperatures in Palestinian agriculture.

Table 7: The Effect of Climate Change Indicators on Labor Supply in Agriculture Sector (per District)

	(1)	(2)	(2)	(4)
Dep. Var:	Total Workers in the Agriculture Sector		Share of Workers in the Agriculture Sector	
	All WB	Northern Districts†	All WB	Northern Districts†
Total Rainfall SV_{-1}	-13.40	35.44	0.000721	0.00729
	(24.45)	(34.54)	(0.00337)	(0.00687)
Total Rainfall SV_{-2}	-13.76	42.29	0.00154	0.00944
	(25.57)	(30.48)	(0.00369)	(0.00660)
Max. Temp. SV_{-1}	-11.66	-51.39	-0.00137	**-0.00967***
	(24.51)	(34.76)	(0.00362)	**(0.00552)**
Max. Temp. SV_{-2}	-9.126	**-52.31****	- 0.000526	**-0.00940****
	(19.66)	**(22.81)**	(0.00306)	**(0.00439)**
Min. Temp. SV_{-1}	-7.552	-15.32	0.00304	0.00214
	(22.64)	(30.49)	(0.00504)	(0.00667)
Min. Temp. SV_{-2}	0.318	-2.354	0.00109	-0.000801
	(19.72)	(32.37)	(0.00365)	(0.00542)
Observations	226	116	214	116
R-squared	0.706	0.750	0.696	0.687
SD dependent var	389.212	329.988	0.07	0.093
SD dependent var	465.293	257.703	0.053	0.051
Year Fixed Effect	YES	YES	YES	YES
District Fixed	YES	YES	YES	YES

† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<0.01, ** p<0.05, * p<0.1

8. CONCLUSION

The findings of this study underscore the critical importance of climate change indicators, particularly variations in rainfall and temperature, in shaping labor decisions among individuals engaged in agriculture. Increased precipitation in the previous year or two years prior generally correlates with higher labor supply in the agricultural sector, though this effect is modulated by regional differences stemming from diverse agricultural practices and irrigation methods. For example, in areas like Jericho, where alternative water sources mitigate the reliance on rainfall for irrigation, the association between rainfall and agricultural labor supply becomes more intricate. Additionally, the specific crops cultivated, such as horticultural trees and field crops, can significantly influence farmers' responses to changes in rainfall. Temperature variations also play a pivotal role in labor decisions, with an increase in maximum temperature negatively impacting labor supply, while an increase in minimum temperature can have a positive effect, particularly in regions where fruits and vegetables are predominant. These findings correlate with the vulnerability of certain crops to temperature fluctuations and frost events. Moreover, the study also reveals that factors like gender, education, age, and self-employment significantly contribute to shaping labor decisions within the agricultural sector, along with the influence of parental occupation. These elements further compound the complexity of labor allocation patterns. Furthermore, our research delves into two mechanisms through which climate change affects labor decisions: the migration of agricultural workers to the Israeli labor market and the impact of climate shocks on agricultural wages.

The implications of this study highlight the pressing need for adaptive strategies and policy interventions to address the challenges posed by climate variability and its effects on the livelihoods of the populace in the region. By developing and implementing these strategies, policymakers can help safeguard the well-being of agricultural communities and the sustainability of the agricultural sector. Furthermore, we emphasize the importance of educating farmers on the concept of agricultural insurance and promoting its adoption. This proactive approach can help farmers mitigate the financial risks associated with climate change. Looking forward, future research should delve deeper into the specific adaptation measures that can enhance resilience among agricultural workers and the agricultural sector in the face of ongoing climate change. Additionally, research can explore the role of government policies and international collaboration in supporting climate-resilient agriculture in the West Bank. By doing so, we can work toward a more sustainable and secure future for the region's agricultural communities.

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APPENDIX A

Table A.1: Additional Result: The Effect of Climate Change Indicators on the Probability of Working in the Agriculture sector (out of the labor force)

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var: Probability of Working in the Agriculture Sector (out of the working labor force)	All WB	Jericho	Northern Districts†	Hebron	All WB	Jericho	Northern Districts†	Hebron
Total Rainfall SV_{-1}	-0.00378	-0.0688	0.00621	-0.0308**				
	(0.00331)	(0.0443)	(0.00536)	(0.0147)				
Total Rainfall SV_{-2}	-0.00863***	0.0753*	-0.00251	0.0283***				
	(0.00320)	(0.0428)	(0.00472)	(0.00977)				
Max. Temp. SV_{-1}					-0.0145***	-0.0490	-0.0192***	-0.175***
					(0.00421)	(0.0584)	(0.00594)	(0.0305)
Max. Temp. SV_{-2}					-0.00553	-0.0792	-0.0151**	0.126***
					(0.00412)	(0.0807)	(0.00665)	(0.0250)
Min. Temp. SV_{-1}					0.0158***	0.114	0.0238***	0.148***
					(0.00447)	(0.0948)	(0.00622)	(0.0262)
Min. Temp. SV_{-2}					-0.00858**	0.143	-0.0122**	-0.131***
					(0.00384)	(0.105)	(0.00536)	(0.0223)
Observations	34,997	699	22,183	6,629	34,997	699	22,183	6,629
R-squared	0.409	0.304	0.372	0.287	0.409	0.304	0.373	0.287
Mean dependent var	0.49	0.539	0.614	0.382	0.49	0.539	0.614	0.382
SD dependent var	0.5	0.499	0.487	0.486	0.5	0.499	0.487	0.486
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES
District Fixed	YES	NO	YES	NO	YES	NO	YES	NO

Robust standard errors in parentheses.
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.
Controls include worker gender, age, age squared, schooling, and an indicator for self-employment.
Climate change indicators standardized values for rainfall, maximum and minimum temperature in the same year)
SV stands for Standardized Value in the preceding one or two years, respectively.
*** p<0.01, ** p<0.05, * p<0.1

Table A.2: Descriptive Statistics for the Observation Not in the Labor Force

Variable	Obs	Mean	Std. Dev.	Min	Max
Share of Workers in Agriculture Sector					
All West Bank districts	34,997	0	1	0	1
Jericho	699	1	0	0	1
Northern districts†	22,183	1	0	0	1
Hebron	6,629	0	0	0	1
Male worker	34,997	1	0	0	1
Years of School	34,997	8.96	4.31	0	22
Age	34,997	35.50	16.04	10	98
Self employed	34,997	0.18	0.38	0	1

Source: Own calculation based on PCBS (2011), Agricultural Statistics Survey.

Table A.3: Observed Characteristics of Workers in the Agriculture Sector

Variable	Obs	Mean	Std. Dev.	Min	Max
Share of Workers in Agriculture Sector **in Israeli Labor market**					
All West Bank districts	65,213	0.12	0.33	0	1
Jericho	8,021	0.10	0.30	0	1
Northern districts†	36,952	0.17	0.38	0	1
Hebron	13,455	0.10	0.30	0	1
Male worker	65,213	0.67	0.47	0	1
Years of School	65,213	7.81	3.84	0	22
Age	65,213	34.49	14.50	10	65
Self employed	65,213	0.29	0.46	0	1

Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey.

Table B.1: **Number of Agricultural Holdings in the West Ban, by Type of Holding, Method of Holding Management and Governorate, 2009/2010**

	(1) **Holder Himself**	(2) **Member of the Holders Family**	(3) **Paid Manager**	(4) **Not Stated**	(5) **Total**
West Bank	65,790	23,231	1,640	247	90,908
%	**0.72**	**0.26**	**0.02**	**0.00**	

Source: Own calculation based on PCBS (2011), Agricultural Statistics Survey.

Table B.2: Cultivated Area (in Dunums) of Horticulture Trees, Vegetables and Field Crops in theWest Bank by Region, 2009/2010

	(1) **Horticulture Trees**	(2) **Vegetables**	(3) **Field Crops**	(4) **Total**
West Bank	501,818	100,579	223,906	826,303
%	**0.61**	**0.12**	**0.27**	
Jericho	7,007	26,299	2,971	36,278
%	**0.19**	**0.72**	**0.08**	
Northern Districts†	333,364	62,704	128,756	524,824
%	**0.64**	**0.12**	**0.25**	
Hebron	70,290	7,309	79,144	156,743
%	**0.45**	**0.05**	**0.50**	

Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.

Table B.3: **Number of Plants and Mixed Holdings in the West Bank by Main Source of Irrigation and Governorate, 2009/2010**

	(1) **Rainfed**	(2) **Other***	(3) **Total**
West Bank	68,062	11,967	80,029
%	**0.85**	**0.15**	
Jericho	10	798	808
%	**0.01**	**0.99**	
Northern Districts†	36,899	7,267	44,166
%	**0.84**	**0.16**	
Hebron	15,135	1,807	16,942
%	**0.89**	**0.11**	

Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey
* Other includes Artesian Wells, Streams and Valleys, dug wells, Tanks, Ponds and Collective wells, Springs, Public Networks, Tanks, and More Than One Type of Main Source of Irrigation.
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.

Table B.4: **Area of Field Crops (in Dunums) in the West Bank by Type of Irrigation and Governorate, 2009/2010**

	(1) Rainfed	(2) Other*	(3) Total
West Bank	218,507	14,420	232,928
%	**0.94**	**0.06**	
Jericho	117,109	11,634	128,743
%	**0.91**	**0.09**	
Northern Districts†	788	2,184	2,971
%	**0.27**	**0.73**	
Hebron	78,593	551	79,144
%	**0.99**	**0.01**	

Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey
* Other includes Artificial, Drip, and Sprinklers.
Number of Agricultural Holdings that have Vegetables in the Palestinian Territory by Type of Irrigation, Method of Irrigation and Governorate, 2009/2010
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.

Table B.5: **Number of Agricultural Holdings that Have Vegetables in the West Bank by Type of Irrigation, Method of Irrigation and Governorate, 2009/2010**

	(1) Rainfed	(2) Other*	(3) Total
West Bank	5,187	8,383	13,570
%	**0.38**	**0.62**	
Jericho	2,566	4,863	7,429
%	**0.35**	**0.65**	
Northern Districts†	6	625	631
%	**0.01**	**0.99**	
Hebron	1,446	1,699	3,145
%	**0.46**	**0.54**	

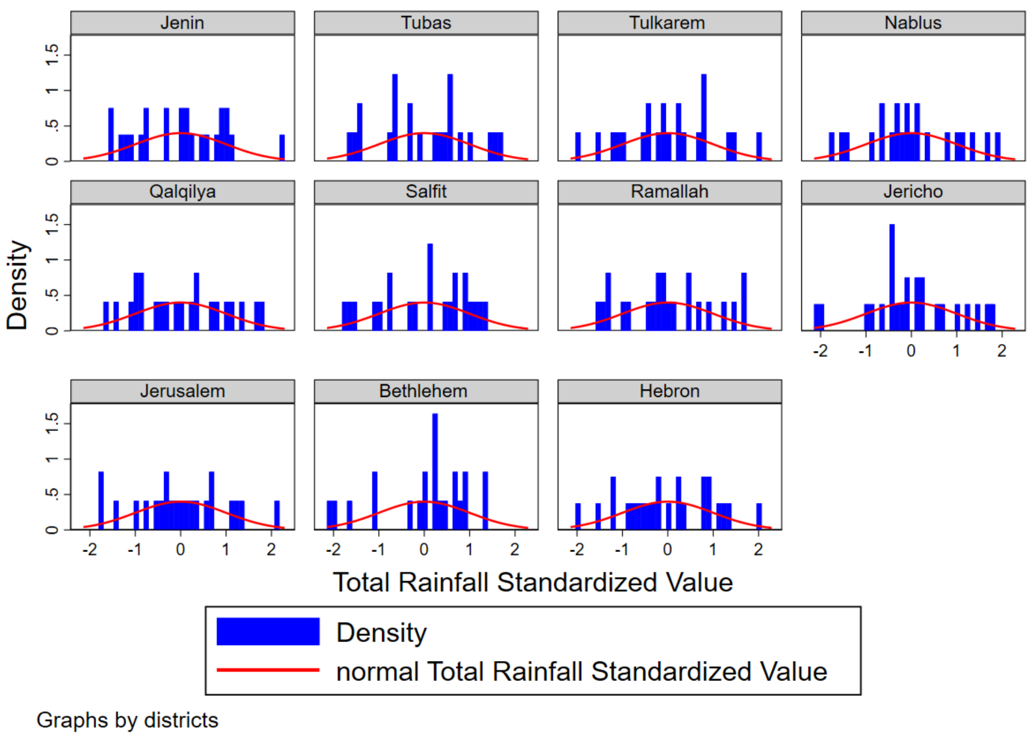
Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey
* Other includes Artificial, Drip, and Sprinklers.

Table B.6: **Number of Agricultural Holdings which have Tree Horticulture in the West Bank by Type of Irrigation and Governorate, 2009/2010**

	(1) Rainfed	(2) Other*	(3) Total
West Bank	69,254	6,847	76,101
%	**0.91**	**0.09**	
Jericho	23	397	420
%	**0.05**	**0.95**	
Northern Districts†	38,252	4,484	42,736
%	**0.90**	**0.10**	
Hebron	14,215	527	14,742
%	**0.96**	**0.04**	

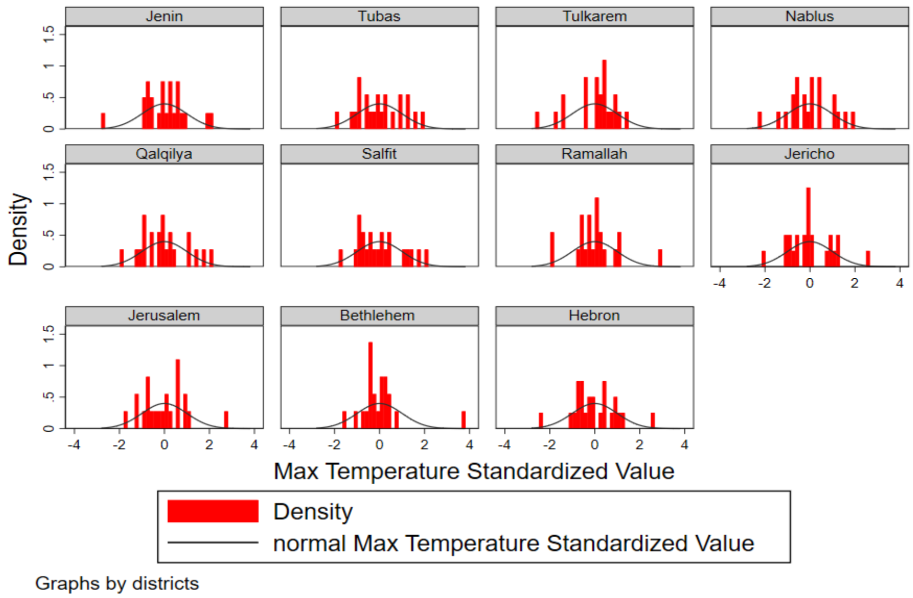
Source: Own calculations based on PCBS (2011), Agricultural Statistics Survey
* Other includes: Open Irrigated, Protected and not stated method
† Northern districts include Jenin, Tubas, Tulkarem, Nablus, Qalqilia, and Salfit.

Figure A.1: Total Annual Rainfall in (Standardized Value) per West Bank Districts Over the Period 1999–2018



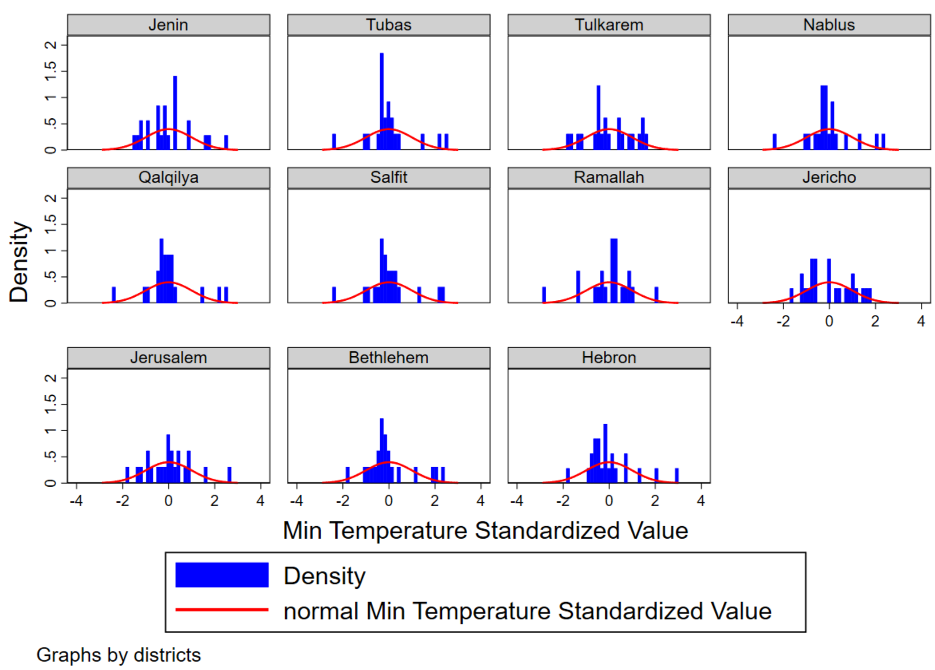
Source: Own calculations based on PCBS data.

Figure A.2: Average Maximum Temperature (Standardized Value) per West Bank Districts Over the Period 1999–2018



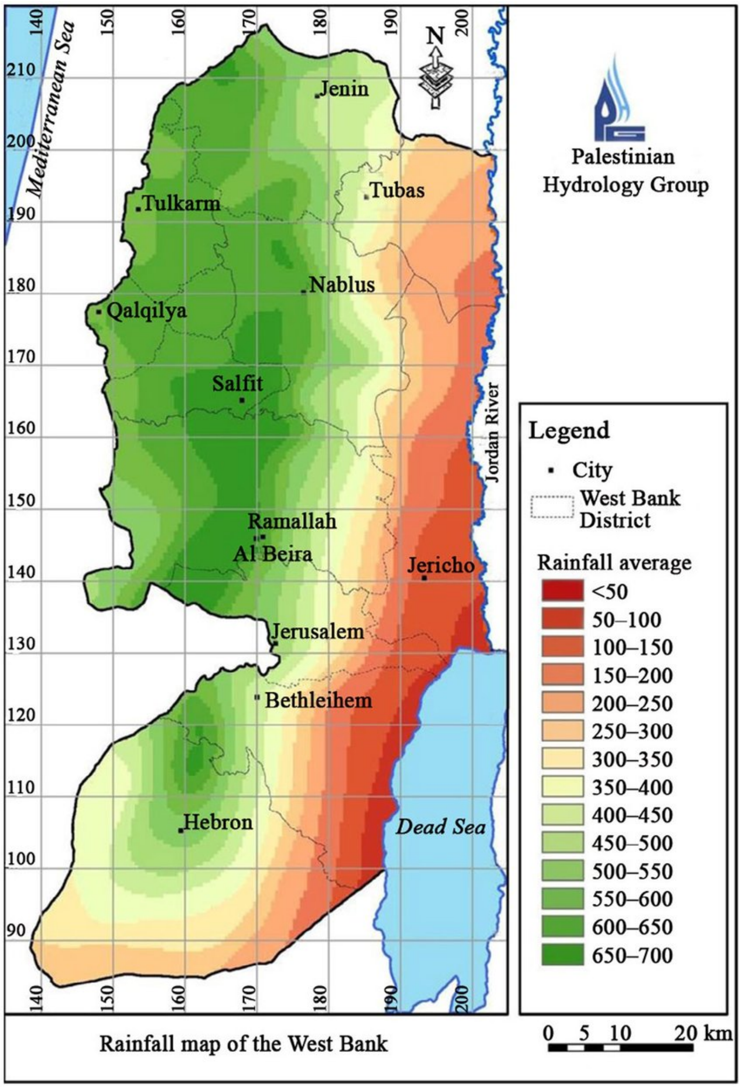
Source: Own calculations based on Palestinian Meteorological Department data.

Figure A.3: Average Minimum Temperature (Standardized Value) per West Bank Districts Over the Period 1999–2018



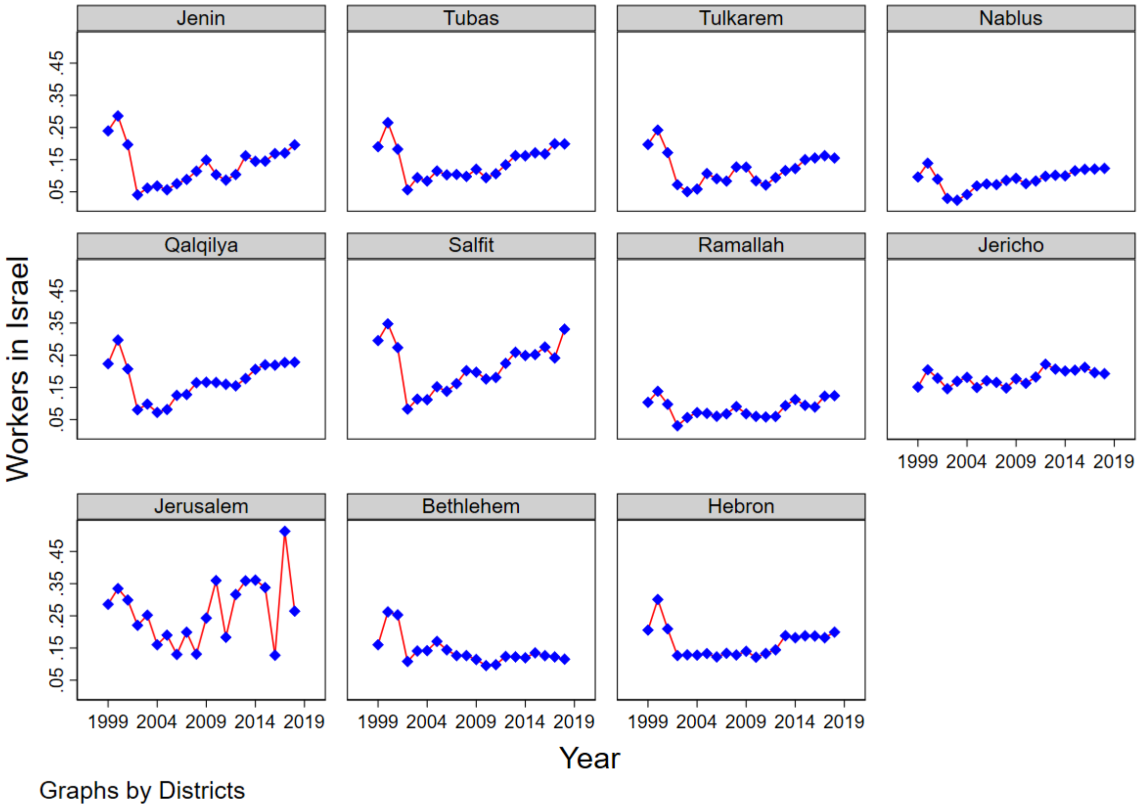
Source: Own calculations based on Palestinian Meteorological Department data.

Figure A.4 Average Annual Rainfall in the West Bank



Source: Palestinian Hydrology Group (Amr et al. 2018)

Figure A.5 Share of Workers in Israel per West Bank Districts Over the Period 1999–2018



Source: Own calculations based on LFS 1999–2018