Religious Festivals and Economic Development: Evidence from Catholic Saint Day Festivals in Mexico[*]

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Abstract: Religious festivals are widespread around the world, and often make up nontrivial shares of household expenditures. What are festivals' economic and social consequences? We study Catholic patron saint day festivals in Mexico, exploiting two features of the setting: (i) festival dates vary across the calendar and were determined in the early history of towns during conquest, and (ii) there is considerable variation in the intra-annual timing of agricultural seasons. We compare municipalities with "poorly-timed" festivals (those that overlap with peak planting and harvest months) to other municipalities, examining differences in long-run economic development and social outcomes. Poorly-timed festivals lead to worse economic development along a range of measures. They also lead to lower agricultural productivity, higher shares of the labor force in agriculture, and higher religiosity. The negative impact of poorly-timed festivals on agricultural productivity impedes the structural transformation out of agriculture and thus overall economic growth. The increase in religiosity may help explain why poorly-timed festivals persist in spite of their negative growth consequences.

Keywords: Religion, Economic Development, Mexico, Catholicism, Liquidity Constraints

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1. Introduction

Across many developing countries, people living under \$1 a day tend to spend large amounts of their monthly incomes on religious festivals. For example, individuals living on less than \$1 a day in Udaipur, India, spend 14 percent of their monthly budgets on festivals, while individuals in Morocco living under \$1 a day spend 10 percent of their budget on festivals (Banerjee and Duflo, 2011). Given the importance of festival expenditures for the poor, scholars have debated whether these religious festivals are beneficial or detrimental for long-run growth. On the one hand, religious festivals may improve development if higher expenditures lead to larger festivals that create more social capital and ultimately spur more economic growth (Putnam, 2000, McCleary and Barro, 2006a). On the other hand, high levels of religious festival expenditures may be detrimental to long-run economic growth, if they lead to reductions in resources devoted to other growth-stimulating investments (Barro and McCleary, 2003).

Well-identified, causal estimates of the impact of religious practices have been difficult to obtain. This is because religious festivals are not generally assigned exogenously across individuals or geographic areas. The timing and features of religious festivals may could be directly affected by economic development itself, or by other omitted variables that jointly affect development and features of festivals. Festival timing and characteristics could be chosen (or could evolve endogenously) to maximize positive effects or minimize negative effects on economic development. Additionally, religious festivals often affect an entire country at once, making it difficult to exploit within-country variation in festival characteristics. Both these challenges have led to a lack of causal, within-country evidence of the impact of religious festivals on long-run economic development.

In this paper, we make progress on a piece of the puzzle of religion's impact on society, by studying religious festivals that were exogenously imposed by outsiders. Many developing countries had religious festivals imposed on them by colonial powers, replacing endogenously-developed local religious traditions (Henrich, 2017). Exogenously-imposed festivals could be more likely to be detrimental to economic development. We investigate a particular religious practice in Mexico: patron saint day festivals. In Mexico and many other Roman Catholic countries, towns and cities celebrate the "patron saint day" of a particular saint or other holy figure that has been historically associated with the town. Hundreds of such celebrated figures have their saint day festivals that are spread throughout the calendar year, on dates set by the Catholic hierarchy in the Vatican.[1] These saint day festivals are typically local public holidays, and involve substantial financial expenditures by local households and governments. In Mexico and most of Latin America, patron saints were typically established at the time of a town's founding by Spanish colonizers, often centuries ago, and remained set thereafter.

To examine how religious festivals affect economic development, our analysis combines two features of the setting. First, festival dates vary greatly across localities, and were determined in the early history of towns during Spanish conquest. Second, the intra-annual timing of the main agricultural planting and harvest times varies tremendously across Mexico.[2] This means that, for some municipalities, the saint day festival overlaps with the planting or harvest season, whereas in other municipalities there is no such overlap.

We exploit this variation in festival timing and compare municipalities where the festival overlaps with the main crop's planting and harvest season to municipalities where they do not overlap to examine the impacts on economic development and social outcomes. We hypothesize that festivals that overlap with the planting or harvest seasons negatively affect long-run development outcomes. During the planting and harvest seasons, households need to undertake investments and expenditures for agriculture. If households are liquidity-constrained, festival expenditures in these key time periods may crowd out longer-horizon agricultural investments. In the planting season, festival expenditures reduce funds available for investment in agriculture (e.g., in land preparation, fertilizer, and seeds). Festivals occurring during harvest times reduce households' total harvest income by requiring them to sell crops during peak harvest times, when crop prices are low (Burke et al., 2019). Harvest festivals therefore lower the realized value of harvested crops, and fewer resources area available to be saved and invested in the next planting season. "Poorly-timed" (planting and harvest) festivals thereby lead to lower agricultural productivity. Lower agricultural productivity results in slower long-run economic growth and less structural transformation of the economy from agriculture to manufacturing and services.

To conduct our analysis, we created a new dataset of patron saint day festival dates for Mexican municipalities, assembling data from online data sources and phone interviews with municipality

[1]For example, towns whose patron saint is St. Arcadius (in Spanish, *Arcadio*) have their festival on January 12, while those with St. Fructus (in Spanish, *Fructuoso*) as their patron celebrate on October 25.

[2]For example, in the state of Aguascalientes, the most important planting month is October, while in Nayarit it is April.

officials. We combine these data with data on locally-specific optimal planting and harvest dates to create measures of whether festivals occur during main planting or harvest periods. We then use numerous data sources from the Mexican government to explore municipality-level development outcomes in the present day.

The main identification assumption of our cross-sectional analysis is that the overlap of a locality's festival date and the timing of its agricultural seasons is exogenous. This is a different and more plausible assumption than assuming festival dates are exogenous. While the history of saint day festival determination in Mexico is consistent with this assumption, we present a number of empirical tests to examine whether this assumption is plausible, particularly after controlling for state fixed effects and exploiting only cross-town variation within Mexican states. First, we demonstrate that municipalities in Mexico show no tendency to have festivals occur away from planting or harvest months. This helps rule out an important endogeneity concern, that municipalities intentionally choose the timing of festivals to avoid planting or harvest periods. If this were occurring differentially for municipalities with certain characteristics, this would raise concerns about selection bias. Second, we show that the propensity to have a festival overlap with planting or harvest is not associated with important geographic and historical characteristics that may affect development. These tests provide evidence that the overlap between a town's festival date and the timing of its agricultural season is plausibly exogenous, and can be used to examine the impacts of festival timing on economic development.

We first investigate the hypothesis that towns whose festivals occur during planting or harvest months, compared to towns whose festivals happen in other months, have worse development outcomes in the long-run. To avoid data mining concerns, we first construct an index of economic development based on all development-related variables in the Mexican Census, and use this index as our main outcome of interest. We find strong evidence that municipalities with "poorly-timed" festivals have worse development outcomes. These results are consistent with the hypotheses that festivals can crowd out investments when they overlap with key agricultural periods.

In additional analyses, we explore potential mechanisms behind our results. We provide strongly suggestive evidence that the long-run negative impacts of planting-time festivals occur due to negative impacts on the agricultural sector. Locations with either planting-season or harvest-season festivals are less productive in agriculture. They have also experienced less structural transformation: they have less of a tendency to have transitioned their labor forces out of agriculture and towards the manufacturing and services sector. This latter finding is telling, given that improvements in agricultural productivity and the subsequent transition of labor forces from agriculture towards more modern sectors is one of the most prominent features of the economic development process (Herrendorf et al., 2014, Caselli, 2005).

Further, we provide evidence that helps explain why planting- and harvest-season festivals continue to persist, even given their negative impacts: they lead to higher religiosity. We use detailed survey data from the Americasbarometer from 2004 to 2018 and examine a variety of measures of religiosity. We find that municipalities where festivals overlap with planting or harvest have higher religious group participation rates and higher propensity to say that religion is important in one's life. Higher religiosity may lead to greater adherence to religious customs and traditions, including the celebration and timing of festivals, explaining why poorly-timed festivals are not modified even if they have negative development consequences. There may thus exist a vicious cycle in which poorly-timed festivals reduce development, but raise religiosity, and the increased religiosity helps poorly-timed festivals persist.

We also find that areas with poorly-timed festivals also have lower income inequality. Lower income inequality may be a consequence of the negative development impact of poorly-timed festivals. This equity-efficiency tradeoff is consistent with Mexican localities being on the initial development stage (left hand side) of the Kuznets curve (e.g. Kuznets, 1955, Robinson and Acemoglu, 2002).

The paper contributes to several literatures. First, we contribute to the literature on the impact of religion on economic development (see McCleary and Barro (2006a, 2019) for reviews). Early papers in this literature compared differences in religion across countries and found a negative correlation between religious behavior (e.g., attendance at religious services) and economic growth and income (Barro and McCleary, 2003). Recent work has focused on specific cases of religious celebration and exploited differences across countries and time to explore short-run and causal impacts of religion on development. Campante and Yanagizawa-Drott (2015) exploit exogenous differences in the length of Ramadan fasting across countries and time due to the rotating Islamic calendar. They find that longer Ramadan fasting has significant short-run negative impacts on economic growth in Muslim countries. Our paper builds on this newer literature which focuses on specific cases of religious celebrations to generate causal evidence. We also contribute to this literature by examining a setting that allows us to examine within-country differences in religious festivals, and present evidence of the long-run effects of these practices.

Second, we contribute to the large social science literature on the impacts of religious practice on religious social capital. Many papers have found that religious practices have social capital benefits (Putnam, 2000, Deaton and Stone, 2003, Lim and Putnam, 2010). These social capital benefits of religion are often cited as a potential reason for their persistence despite their effects on economic growth (Bentzen, 2019). In fact, Campante and Yanagizawa-Drott (2015) also find that longer Ramadan fasting has positive impact on subjective well-being despite the negative effects on economic growth. We contribute to this literature by revealing a possible reason why festivals persist even when they have negative impacts on long-run economic growth: they enhance religiosity, as well as bring reductions in inequality.

Finally, we contribute to the literature on the comparative development of Latin America. Scholars have posited many reasons for Latin America's relatively poor long-run development path, including differences in factor endowments (Engerman and Sokoloff, 2002); the prevalence of colonial extractive institutions (Acemoglu et al., 2001, Acemoglu and Robinson, 2012, Dell, 2010); the high incidence of disease and use of labor coercion during Spanish colonial rule (Sellers and Alix-Garcia, 2018); missionary presence (Valencia Caicedo, 2019, Waldinger, 2017); and the negative consequences of the dismantling of local pre-colonial institutions (Diaz-Cayeros, 2011, Diaz-Cayeros and Jha, 2016). However, while the Catholic religion is a central part of many people's lives in Latin America, the consequences of this religion being imposed on Latin America remain understudied.

Our work concords with the arguments of anthropologists who have highlighted potential negative impacts of saint day festivals on development. Harris (1964) argued that these festivals involved "enormous economic burdens" and "irrational uneconomic" behaviors that impeded development in Latin America, and Greenberg (1981, pg. 153-158) notes that the consequences of festivals for development depended on the exact timing of festival expenditures vis-a-vis the agricultural calendar.

The paper is organized as follows. Section 2 presents our conceptual framework for how festival timing may impact economic development. Section 3 provides background on Catholic saint day festivals in Mexico, their cultural and economic importance, and how they were chosen. Section 4 describes the data, and Section 5 describes the empirical strategy and tests the main identifying assumptions. Section 6 presents that main results by analyzing differences in economic development between municipalities where festivals overlap with planting/harvest to those with no overlap. Section 7 explores the mechanisms underlying the results. Section 8 explores the impact of festivals on social capital. Section 9 concludes.

2. Conceptual Framework

We first consider theoretically how festivals occurring at different times of the year might affect long-run development. The overall argument is as follows. Festivals can be "poorly-timed", occuring in periods that have other high-return and time-sensitive investment opportunities. Given our interest in long-run development processes, and the fact that the vast majority of our locations historically began as agricultural areas, we focus on key time periods when there are high-return, time-sensitive agricultural investment opportunities: the planting and harvest periods. Festivals require expenditures, and because of liquidity constraints, a poorly-timed festival leads to lower agricultural investments. Because festival timing is persistent, poorly-timed festivals lead to long-run reductions in agricultural productivity. Persistently lower agricultural productivity hinders the structural transformation out of agriculture and long-run economic growth. Lower development also slows the secularization process, and increased religiosity leads to resistance to changing religious traditions (including the celebration and timing of religious festivals). This can constitute a self-reinforcing cycle in which poorly-timed festivals persist due to higher religiosity, in spite of their negative economic consequences. Areas with poorly-timed festivals end up with lower levels of economic development in the long run.

2.1. Planting and Harvest Investment Opportunities

Agricultural production is seasonal, with distinct planting and harvest seasons. Planting and harvest seasons are locally-specific: they vary across localities due to climatic and geographic variation, but are common to households in the same locality. In these key seasons, households have the opportunity to undertake high-return investments, but face liquidity constraints that may limit their ability to take advantage of them.

In the planting season, there are high returns to investing in agricultural inputs such as fertilizer and seeds, as well as devoting intensive labor time to planting activities. A large literature in development economics documents the importance of liquidity and financial constraints in developing countries in general, and in agriculture specifically.[3]

Investments in the planting season are realized in the harvest season, some months later. Households in the same locality harvest simultaneously, leading to an outward shift in the local supply of crops. Markets are incompletely spatially integrated, so high local harvest-period supply leads to lower local crop prices. (Gibson, 1964) documents that this intra-annual maize price variation – with dramatic price declines at harvest time – was prominent in colonial Mexico owing to high transport costs between localities. This crop-price seasonality creates a high-return investment opportunity in the harvest period: delaying sale of harvested crops until later months when prices are higher. Households can take advantage of this investment opportunity by storing (not consuming) harvested crops, using savings or credit for household consumption during peak harvest months. Savings or credit constraints may limit the ability to take advantage of this harvest-period investment opportunity (Burke et al., 2019).

2.2. Poorly-Timed Festivals

Religious festivals are costly, but yield benefits for celebrants. There are consumption or entertainment benefits, as well as utility stemming from increased religiosity. Festivals are locally-specific, celebrated by entire localities at once, but their specific timing on the calendar varies across localities. Festival timing is exogenous; in the Mexican case, they were imposed on localities by Spanish conquerors.

Because festivals are costly and happen at a particular point in calendar time, poorly-timed festivals can affect liquidity-constrained households' ability to take advantage of other investment opportunities. Planting festivals divert resources and labor time from agricultural investments and activities. Harvest festivals lead households to sell more of their crops at times when crop prices are unusually low (to get access to funds for festival expenditures), reducing their ability to take advantage of storage and delayed crop sale.[4] The realized value of agricultural income is lower as a result, and fewer resources available to save and invest in the next planting season. Negative economic consequences of Mexican saint day festivals, particularly "poorly-timed" ones

[3]See Besley (1995) and Karlan and Morduch (2010) for reviews.

[4]In a related vein, Dillon (2020) finds that a shift in the Malawian school calendar that made school-fee payments due closer to the harvest period (when crop prices are unusually low) led to higher crop sales in that low-price period to pay for the school fees, and lower overall harvest income.

that overlap with key agricultural periods, have been noted by anthropologists (e.g., Harris, 1964 and Greenberg (1981)).[5]

2.3. *Impact on Structural Transformation and Long-Run Economic Growth*

Planting festivals reduce the ability to invest in planting inputs and activities. Harvest festivals lead farm households to sell crops earlier than they would otherwise, reducing the returns to agriculture overall. The upshot is that areas with poorly-timed festivals have persistently lower agricultural productivity.

Persistently lower agricultural productivity in places with poorly-timed festivals could lead to worse long-run development outcomes. A long-running literature in development economics has argued that agricultural productivity growth can lead to overall economic growth by stimulating the structural transformation of the economy towards modern (manufacturing and services) sectors (declining shares of agriculture in GDP and in the labor force).[6] Recent theoretical work has formalized this point in two-sector growth models with an agricultural and a modern or non-agricultural sector.[7] When there are subsistence constraints (a minimum agricultural or food consumption requirement), demand for agricultural goods is income-inelastic, and the economy is closed to trade (so that domestic agricultural production is necessary), agricultural productivity needs to rise before labor moves from agriculture to the modern sectors. Agricultural productivity growth leads to overall economic growth and a structural transformation out of agriculture. Recent empirical studies have examined this question, with some finding causal evidence that increases in agricultural productivity lead to structural transformation and economic growth.[8]

2.4. *Religiosity and Persistence*

In subsequent sections, we show that it is rare for a community to change their saint day festival celebration date, and find no empirical evidence of selective changing of patron saints

[5]One could imagine that harvest festivals may also have negative consequences for another reason: they may lead to higher temptation spending than festivals in other times of the year, because harvest time is an unusually high-income period. Duflo et al. (2011) study how temptation spending can deplete harvest earnings, so that fewer resources are available for investment in the next planting season. But there is actually little evidence that temptation spending rises when liquidity constraints are loosened (Banerjee et al., 2017, Evans and Popova, 2017, Kerwin et al., 2020).

[6]Key references include Schultz (1953), Johnston and Mellor (1961), Johnston and Kilby (1975), Timmer (1998), Johnson (2000). Outside of economics, Diamond (1997) makes a similar argument.

[7]See, among others, Laitner (2000), Caselli and Coleman (2001), Caselli (2005), Gollin et al. (2002, 2004, 2007), Restuccia et al. (2008). Herrendorf et al. (2014) review the literature on structural transformation and growth.

[8]See, among others, Foster and Rosenzweig (2004, 2007), Nunn and Qian (2011), Hornbeck and Keskin (2014), Gollin et al. (2018), Bustos et al. (2020).

to avoid poorly-timed festivals. If poorly-timed festivals lead to worse long-run development outcomes, why would they persist? Why don't communities simply celebrate their saints on different dates, or change their celebrated saints to ones whose festival dates do not overlap with planting or harvest? A self-reinforcing cycle between development and religiosity may be at work. Many scholars have argued that low economic development leads to higher religiosity (lower secularization) (e.g., Durkheim (1912)). Empirical studies have found that higher income levels across societies are associated with more secular attitudes (lower religiosity),[9] and that higher education contributes to secularization.[10] Higher religiosity may increase adherence to religious traditions such as saint day festivals, and increase opposition to changing them. There may then be a vicious cycle in which poorly-timed festivals reduce development, raising religiosity, and the increased religiosity promotes persistence of poorly-timed festivals.

3. Saint Day Festivals in Mexico

3.1. Cultural and Economic Significance of Saint Day Festivals

Patron saint day festivals are yearly celebrations that occur in Catholic countries, especially those influenced by Spanish culture.[11] A saint day festival is usually dedicated to a patron saint or virgin who was determined to be the patron (protector) of a given locality. Hundreds of such celebrated saints have their saint day festivals on dates all throughout the calendar year, on dates set by the Catholic hierarchy in the Vatican. Saint day festivals often begin and close with a mass in the saint's honor. Festivals involve concerts, fireworks, food stands, and music for many days. These saint day festivals are typically local public holidays, and involve substantial financial expenditures by local governments as well as households (Lastra et al., 2009).

In Mexico, saint day festivals acquired major economic and cultural significance following Spanish conquest. As part of efforts to convert local populations to Catholicism, saint day festivals became "one of the most important activities of the municipal governments" (Tanck de Estrada, 2005, pg. 31). The historian Charles Gibson calculated that the villages in the Valley of Mexico spent three fourths of their annual municipal income on religious festivals and church ornaments

[9] For example, Barro and McCleary (2003), Lipford and Tollison (2003), McCleary and Barro (2006a), Paldam and Gundlach (2013).

[10] See McCleary and Barro (2006b), Hungerman (2014), Becker et al. (2017).

[11] We use the term "patron saint day festival" or "saint day festival" in this paper. This phrasing is synonymous with other terms used in the literature such as "patron saint day fiesta", and "patron saint fiesta".

(Gibson, 1964). Villages held at least three religious festivals per year – the patron saint festival, Corpus Christi, and Holy Thursday – but the patron saint festival was considered the most important festival (Tanck de Estrada, 2005, Tanck de Estrada and Marichal, 2010). Historians and anthropologists have argued that the patron saint day festivals became particularly popular because they naturally commingled Spanish and indigenous religious elements, and allowed indigenous groups to celebrate saints in their own way, with their own interpretations, traditions, and customs (such as dances, music, and food) (Lastra et al., 2009, Beezley and Meyer, 2010).[12] Historically, the festivals generally lasted at least three days, began with a mass the first night, and was followed by elaborate processions, masses, sermons, music, dancing (combining hispanic and indigenous dances), markets, fireworks, bull runs, and a communal meal for the whole village (Tanck de Estrada, 2005, Tanck de Estrada and Marichal, 2010).

By the 1790s, patron saint day festivals had become so large that the colonial government imposed limits on municipal governments' festival spending, calling the "excesses" of the festivals "superfluous and vicious" (Tanck de Estrada and Marichal, 2010, pg. 352). These laws led to the formalization and increased prominence of the distinctive *mayordomia* (or *cargo*) social system, where a rotating set of households assumed responsibility for organizing and financing the annual festival of that town's patron saint (Beezley and Meyer, 2010, Lastra et al., 2009, Monaghan, 1990, Dewalt, 1975).[13]

Becoming a *mayordomo* (festival steward) brought great respect from the community, but involved significant expenditures, "in many cases to [the *mayordomos*'] own financial detriment" (Beezley and Meyer, 2010, pg. 159). *Mayordomos* had little flexibility on the required expenditure amounts because festival expenses were "fixed by custom and agreement" and "varied hardly at all from year to year" (Gibson, 1964, pg. 130). The financial strain for *mayordomos* was particularly high during years with poor harvests, as income "depended on the agricultural year and the market price of the produce" (Gibson, 1964, pg. 130). In fact, Brandes (1981, pg. 212) noted that the "invariably high" financial outlays for *mayordomos* were often so large "that villagers were forced to sell parcels of land in order to meet ritual responsibilities".

[12]In fact, in many parts of Mexico, the name of the patron saint became part of the name of the town (O'Connor and Kroefges, 2008, pg. 310).

[13]Historians and anthropologists have noted that the *mayordomia* social system became popular in Mexican villages (and other parts of Latin America, where it is also known as the *cargo* system) because it combined aspects of the *cofradía* system from Spain – religious co-fraternity groups – and indigenous communal associations (Lastra et al., 2009, Beezley and Meyer, 2010). In Mexico, the number of households that formed the *mayordomia* varied from village to village, but usually involved between 10-40 households (Dewalt, 1975, Brandes, 1981).

Estimates for *mayordomia* expenditures in the historical period are hard to come by; however, even in modern times, *mayordomia* households spend considerable amounts of money: Monaghan (1990, pg. 760) found that, in 1985, the *mayordomia* of the *Virgen del Rosario* in Santiago Nuyoó distributed "204,937 pesos' worth of foodstuff" alone, which is equivalent to approximately $46,425 in 2020 dollars. Greenberg (1981, pg. 149-152) finds that in Santiago Yaitepec, Oaxaca, in 1973, each *mayordomo* spent an average of 4,566 pesos ($2,211 in 2020 dollars) for the patron saint festival. Food and drink expenses made up about half of the *mayordomos'* expenditures and he calculated that these food expenditures alone would be enough "to provide [the village] 13.5 days worth of food per capita annually" (Greenberg, 1981, pg. 149).

In the 1960s and 1970s, anthropologists became very interested in understanding the saint day festival *mayordomia* system (and its persistence) in Mexico (for reviews, see Dewalt, 1975, Smith, 1977, Greenberg, 1981, Chance and Taylor, 1985). Dewalt (1979, pg. 201) noted that the "most striking element of these [*mayodormia*] systems is that generally poor peasants spend considerable time and money sponsoring fiestas to honor the saints", constituting "what appears to be economically irrational behavior".[14] They have proposed at least two main reasons for the persistence and importance of the *mayordomia* system (Chance and Taylor, 1985). First, serving as a *mayordomo* was a costly signal of religiosity and wealth to the community (Monaghan, 1990, Chance and Taylor, 1985). In the view of some anthropologists, serving as a *mayordomo* was a form of "conspicuous consumption" that allowed households to gain community respect (Dewalt, 1979). Second, due to rotating nature of the *mayordomia* system, anthropologists argued that the system also served an important redistribution role within the community, both within a given year across households (Greenberg, 1981, Rosales Martínez et al., 2020), but also across time: *mayordomos* are found to receive preferential access to resources from future *mayordomos* because they are seen as having more reciprocity and religiosity (Monaghan, 1990).[15]

Today, saint day festivals continue to be highly significant in the lives of the people who believe

[14]Likewise, Chance and Taylor (1985, pg. 7) note that for anthropologists "a salient feature of modern fiesta systems in [central Mexico] is that the offices of the ritual celebrations are considered to be *cargos*, a great economic burden."

[15]According to Chance and Taylor (1985), first- and second-wave anthropologists prosposed two additional explanations – empowerment and exploitation – for the popularity of the festivals and the *mayordomo* system. First, by allowing indegenous groups to easily mix in their own religious traditions with the saint day festival organization and celebrations, the *mayordomo* system empowered local populations. Second, in contrast, because the festivals were imposed on indigeneous groups by the Spanish and cost considerable sums of money, some anthropologists argue that the "repressive and abusive" festivals extracted wealth from poor households "originally into the hands of the clergy, then after Independence into those of *hacendados* and merchants" and these outsiders maintain the festivals for their own benefit (Harris, 1964, pg. 25-34).

and practice them to this day (Lastra et al., 2009, Rosales Martínez et al., 2020). Whereas larger cities have become more secular and the saint day festivals have lost importance, they continue to be held in rural and agricultural villages in Mexico (Lastra et al., 2009). In rural villages, the festivals continue to be quite elaborate and costly, and continue to follow a "rigorous protocol... there must be vigils (*velaciones*), masses, ritual blessings and cleansings (*limpias*), processions, dances or dance dramas, music, fireworks, ritual meals, and the ritual handling of special objects and flowers" organized by the *mayodromos* and involve "the participation of men, women, and children of all ages" (Lastra et al., 2009, pg. 2).

3.2. *Exogeneity of Saint Day Festival Timing*

In Mexico and most of Latin America, patron saints were typically established at the time of a town's founding by Spanish colonizers. Because the timing of saint day festivals (relative to key agricultural periods) is central to our analysis, it is important to consider how localities came to celebrate their particular saint days. For countries where conquest and settlement by Europeans goes back centuries (to the 1500s in the case of Mexico), the origins of local festival celebrations are often shrouded in mystery, so the best one can do is collect a set of historical and ethnographic accounts of different places. The key question we have kept in mind is whether the localities ever intentionally choose the timing of saint day festivals (or inadvertently end up doing so) with an eye towards their long-run consequences, such as by avoiding the planting and harvest seasons. Evidence of such timing considerations would raise concerns about selection bias in our estimates.

In a review of the historical and ethnographic literature on saint day festivals in Mexico (e.g., Ragon, 2002, Brewster, 1904, Nutini, 1976, Nutini, 1968), we have found little evidence that such timing considerations come into play. The most important focus appears to be on choosing the saint him- or herself, with typically little mention of the date of the saint's festival. Once a locality has been matched to a saint, in nearly all cases it celebrates their saint day festival on the date given by the Catholic hierarchy in the Vatican that is common for all communities worldwide celebrating that saint.[16]

[16] In rare cases, we found in our data collection that communities in our sample celebrated a saint day festival on a date different from the official date prescribed by the Vatican (fewer than 5% of municipalities in our sample). These dates typically diverge by only a few days from the official date (on average two days of divergence). To rule out endogeneity of festival dates, in our analyses we use the official festival date prescribed by the Vatican for each saint, not a locality's potentially endogenously-chosen festival date.

Some examples of the reasons behind the choice of particular saints by localities illustrates that considerations are typically orthogonal to considerations related to timing of the festival on the calendar. In many cases, saints were chosen based on structural, functional, or symbolic similarities with indigenous gods worshipped in the area (Nutini, 1968). Spanish friars seeking to convert the populations to Catholicism believed they would be more effective if they chose saints that had some resemblance to an indigenous god. For example, the village of San Juan Tianguismanalco was originally associated with the cult of the Aztec god *Tezcatlipoca*. The village was assigned the patron saint Saint John the Apostle given that this saint and Tezcatlipoca both represented youth (Nutini, 1976). In other cases, localities were assigned a patron saint based on salient characteristics of their community and particular functions of saints (Ragon, 2002). The patron saint of cooks, San Pascual Bailon, was chosen in Puebla, a region known for its cuisine (Brewster, 1904).

One category of explanations for the choice of saints does involve a preference for the *date* of their festival celebration. In some localities, Spanish conquerors chose saints whose festival date coincided with key dates in the Spanish conquest of or arrival in the locality. Many cities in Mexico take their saints (and often their locality names) on the basis of the saint whose feast was celebrated on the day the Spanish first visited or created a certain town (Ragon, 2002). For instance, the patron saint of Zacatecas was chosen to be the Virgin Mary because her feast day occurred on the date of the first camp of Juan of Tolosa – a Spanish *conquistador* – upon his arrival in Zacatecas. Importantly, the reason for the preference for certain festival dates has to do with historical events at the time of conquest, and should have no systematic relationship with the timing of agricultural seasons in the locality.

Interestingly, in some places saints were actually chosen at random. Some oral histories describe saint names being physically pulled out of a bowl, or the like. The motivation behind this method was that random selection would allow saints to choose the locality, and that this would enhance the supernatural protection thus afforded (Ragon, 2002).

Even if we believe that the choice of saints in the early history of towns (and the resulting timing vs. agricultural seasons) is plausibly exogenous, one might worry that localities would seek to change their festival dates, once the consequences of their timing revealed themselves. There are indeed cases when communities changed their patron saints, but such cases appear to be rare. Patron saint celebrations are key components of a local community's history and culture.

Perhaps unsurprisingly then, the few reported cases when communities changed their patron saint were motivated by a major negative shock, such as a flood, fire, or earthquake, and the switch was to a saint thought to protect against natural disasters (Ragon, 2002).

Additional qualitative evidence on the exogeneity of the timing of saint day fiestas is provided by Atkinson and Fowler (2014), who studied how saint day festivals that coincide with voting days affect voter turnout. Atkinson and Fowler (2014) surveyed fourteen Catholic priests and officials in Mexico and asked how their particular parish chose their patron saint.[17] They found that "no respondent indicated that the time of year for the fiesta was considered in this decision. Rather, patron saints resulted from idiosyncratic events" and that in many cases "Spanish colonizers chose the patron saint of the community for arbitrary reasons" (Atkinson and Fowler, 2014, pg. 47). This survey evidence from Atkinson and Fowler (2014) provides additional evidence that the saint day festival date of a particular town is exogenous to local characteristics.[18]

In sum, we find no evidence in historical and ethnographic accounts that endogeneity of festival dates is a worry in the Mexican context. In no case have we found a mention that a saint day was set (or changed) to avoid or coincide with important periods in the agricultural calendar. It is key that the focus is usually on choice of the saint (based on a diversity of rationales), and that the festival date then follows the annual religious calendar set by the Vatican. In other cases where early Spanish conquerors sought to implement a specific festival date, the choice was based on coincidence with initial dates of conquest or settlement, rather than anything to do with agricultural seasons.

4. Data

4.1. Data on Saint Day Festivals

We assembled a dataset of saint day festival dates for Mexican municipalities from a variety of sources. The data was in part available on an online data source, the *Encyclopedia of Municipalities in Mexico* (INAFED, 1988). These data were incomplete, however, and were supplemented with

[17]The sample was drawn from an online directory of dioceses and archdioceses in Mexico.

[18]Atkinson and Fowler (2014, pg. 47) provide the translated account for one parish on how their parton saint was chosen: "The people of God were consulted with the approval of the bishop. Here in Tamaulipas, there is great devotion to *Our Lady of Refuge* because we were officially put under the patronage of *Our Lady of Refuge* by the Spanish royalty during colonial times."

data from (i) online searches and (ii) by directly contacting the municipalities in question.[19]

Our primary analyses focus on a relatively homogeneous sample of municipalities in the former "New Spain" (*Nueva España*) region of Mexico. Municipalities in this region all have maize as their primary crop, which simplifies the analysis by allowing us to focus on maize planting and harvest periods for each locality. Maize has been the primary staple crop in the region since pre-colonial times (Gibson, 1964). In other parts of Mexico outside of New Spain, there is more heterogeneity in both agricultural suitability and in the choice of the primary crop – which is often not maize. Thus, the choice of primary crop outside New Spain could possibly reflect endogenous choices to focus on certain non-maize crops in periods closer to the present day.[20] Focusing on New Spain therefore excludes areas that have historically been less suitable for agriculture. And by focusing on an area that has been primarily maize-growing since pre-colonial times, we can sidestep concerns that a locality's primary crop (identified using modern-day data such as the Caloric Suitability Index) may be endogeneous to the economic development process.

New Spain is also distinct from other parts of Mexico on other dimensions relevant for our study. It was the first part of Mexico to be conquered and settled by the Spanish, and was the main administrative unit during early colonial history. The area thus has the longest history of colonial influence in Mexico, which may make Catholic religious traditions like saint day festivals comparatively more important in this region. The historical accounts we cite above about the importance of festivals and the *mayordomia* system all focus on localities in New Spain. Today, saint day festivals remain more important in the former New Spain (central Mexico) than in the rest of the country (Lastra et al., 2009). Municipalities in New Spain are also distinctive in being much smaller in land area and more densely populated compared to municipalities in the rest of the country.[21] More compact, denser populations in New Spain may enhance the role of town-based community celebrations such as saint day festivals.

Figure 1 presents a map of the borders of the New Spain region of Mexico along with the main administrative borders of Mexico. We use the definition of New Spain as of 1786, as in Map 8 of

[19]The *Encyclopedia of Municipalities in Mexico* provided the festival date for 77% of municipalities; the other 23% were determined using online searches (3%) or contacting the municipality governments directly (20%).

[20]The difference in agricultural suitability and in primary crops derives from differences in climate: New Spain is largely temperate and subtropical, while the north is mostly semi-arid and arid desert, while the southeast is tropical (Ricketts et al., 1999).

[21]New Spain municipalities have mean land area of 336.1 square kilometers, compared with non-New Spain municipalities' mean of 2,385.9 sq. km. Mean population density is 308.6 persons per square kilometer in New Spain municipalities vs. 98.0 persons per sq. km. in non-New Spain municipalities. Municipalities in New Spain comprise 60% of the Mexican population (Authors' calculations using the 2010 Census Data).

Gerhard (1993a). Figure 2 presents a map of festival month dates across New Spain municipalities. Of the 1,701 municipalities in the New Spain area of Mexico, we were able to determine the patron saint for 97.41%. The remaining 44 municipalities we were unable to deterime a patron saint (either because we were unable to contact the local government or the municipality stated they did not have a patron saint), and are excluded from the analysis.[22]

Figure 1: Map of Administrative Borders and New Spain Region of Mexico

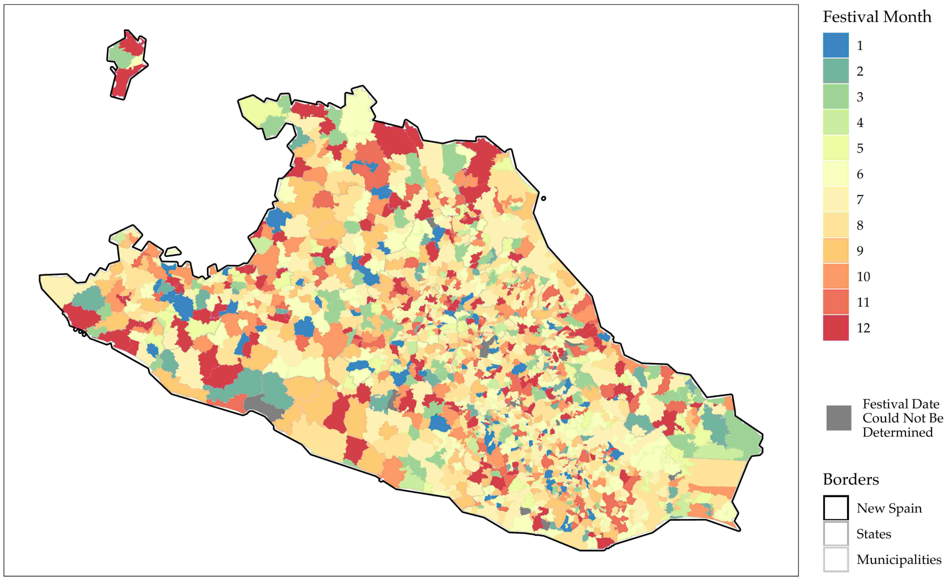
Notes: The map presents the administrative borders for Mexico in varying shades of gray: Country border, State borders, and Municipality borders. Additionally, the map presents the borders for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black.

4.2. *Data on Crop Planting and Harvest Dates (FAO)*

Data on the optimal planting and harvest dates for a number of crops are constructed based on data from the Global Agro-Ecological Zones (GAEZ) project from the Food and Agriculture Organization (FAO). The GAEZ data provides global estimates for crop growth cycles and crop yields for a number of crops at a global grid-cell level (where each grid is $5' \times 5'$, or approximately 100 km^2). For each crop, the GAEZ data supplies the estimates on crop growth cycles and yields under two possible sources of water (rain-fed or irrigation) and under three alternative levels of inputs (low, medium, and high). For each input-water-crop combination, the GAEZ data offers estimates under conditions that are potentially unaffected by human intervention, and under

[22] Appendix Figure 2 presents a map of festival month dates across all Mexican municipalities. In Section 6, we show that our results are robust to considering the sample of all Mexican municipalities for which we have festival dates.

Figure 2: Map of Saint Days - *New Spain* Region of Mexico



Notes: The map presents the month that each municipality in the New Spain region of Mexico celebrates its respective Catholic saint day festival. Section 4.1 describes the construction of the festival date dataset. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

conditions that could potentially reflect human intervention. The estimates incorporate the effect of moisture and temperature on the growth of the crop, the disease environment, as well as climatic-related pest, "workability", and disease constraints. The estimates used in the analysis in this paper for the planting and harvest dates are based on the agro-climatic growth cycles under rain-fed agriculture and low levels of inputs. We use these restrictions to remove potential concerns that the irrigation method and level of agricultural inputs reflect endogenous choices that could be potentially correlated with economic development.

The analysis in the paper focuses at first on the planting and harvest cycle for maize, as maize is and has historically been the most important crop across Mexico for agriculture. Figure 3 presents a map of the optimal maize planting month across Mexico according to the GAEZ estimates. Figure 4 presents a map of the length of the growth cycle for maize across Mexico according to the GAEZ estimates.[23] The maps highlight the large amount of variation across Mexico in the

[23]In some regions of Mexico, maize production is split into two seasons: a primary season thataccounts for approximately 75 percent of total production (usually with planting occuring spring/summer), and a shorter secondary season (usually with planting occuring in the fall/winter) (USDA, 2017). The FAO GAEZ planting and harvest cycle estimates are for the primary season for each grid cell (Fischer et al., 2012). We focus on this primary maize season because it accounts for the majority of the production.

optimal planting and harvest dates for Maize.[24]

We use the GAEZ data to construct the optimal planting date for each municipality by taking the average estimated planting date within grid cells in a municipality. Similarly, we construct the optimal harvest dates across Mexican municipalities by taking the average estimated optimal planting date and adding the average number of days until harvest from the GAEZ estimates for grid cells within each municipality. One potential concern with the GAEZ data is that the predicted optimal planting and harvest dates might not be a strong predictors of actual planting and harvest dates in Mexico. However, using data on the timing of maize harvesting from the *Servicio de Información Agroalimentaria y Pesquera (SIAP)*, we show in Appendix Figure A9 that the GAEZ optimal harvest month strongly predicts theobserved timing of maize harvesting across Mexico.

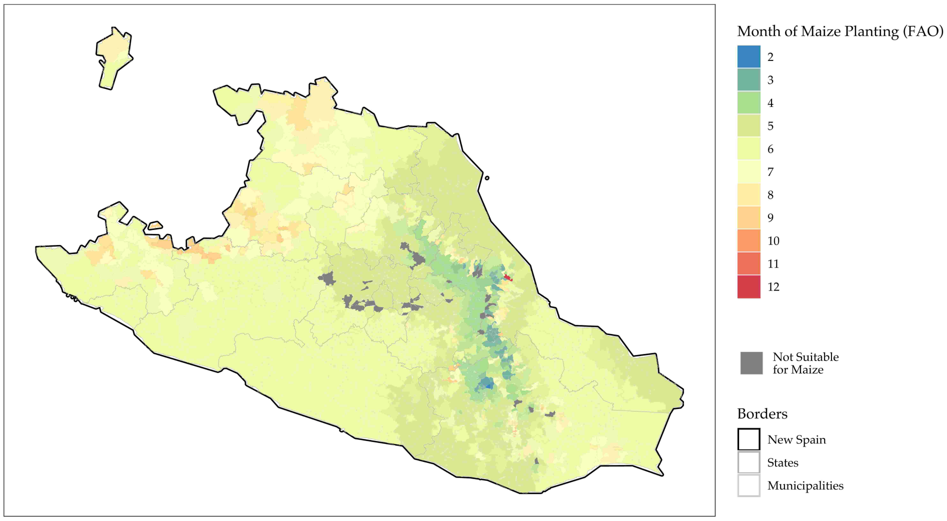
We then use the data on festival data across Mexican municipalities detailed in Section 4.1 to construct measures of how much the timing of the saint day festival celebration in each municipality coincides with planting and harvest dates. Figure 3 presents a map of the overlap (in days) between the saint day festival and maize planting and Figure 4 presents a map of the overlap (in days) between the saint day festival and maize harvest.[25]

We also use data on the potential caloric yield for crops across Mexico using the Caloric Suitability Index (CSI) measures developed by Galor and Ozak (2016). The CSI measures calculate the potential caloric yield per hectare per year under rain-fed agriculture and low level of inputs for a variety of crops. The CSI is meant to ensure comparability in the measures of crop yields across space by capturing the nutritional differences across crops. We use the CSI data to determine the optimal planting and harvest date for the highest caloric-yielding crop in each municipality (instead of only examining maize crop cycles) as robustness check on the impact of festivals overlapping with the agricultural season. Interestingly, the highest caloric-yielding crop across Mexico tends to be maize according to the CSI measure (for crops where we have both CSI estimates and GAEZ growth cycle estimates). This is the case for 73.15% of municipalities. The other max CSI crops across Mexico are: foxtail millet (9.93% of municipalities), wetland rice

[24] Appendix Figures A4 and A5 present the equivalent maps for maize planting dates and maize growth cycle lengths for all of Mexico.

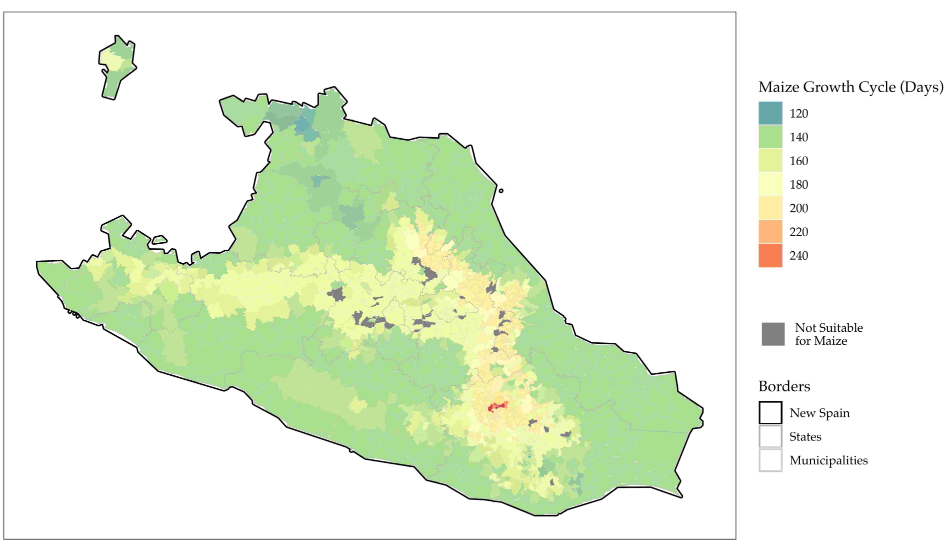
[25] Appendix Figures A6 and A7 present the equivalent maps for the overlap (in days) between the saint day festival and maize planting and maize harvest for all of Mexico.

Figure 3: Map of Optimal Maize Planting Date (FAO data) - *New Spain* Region of Mexico



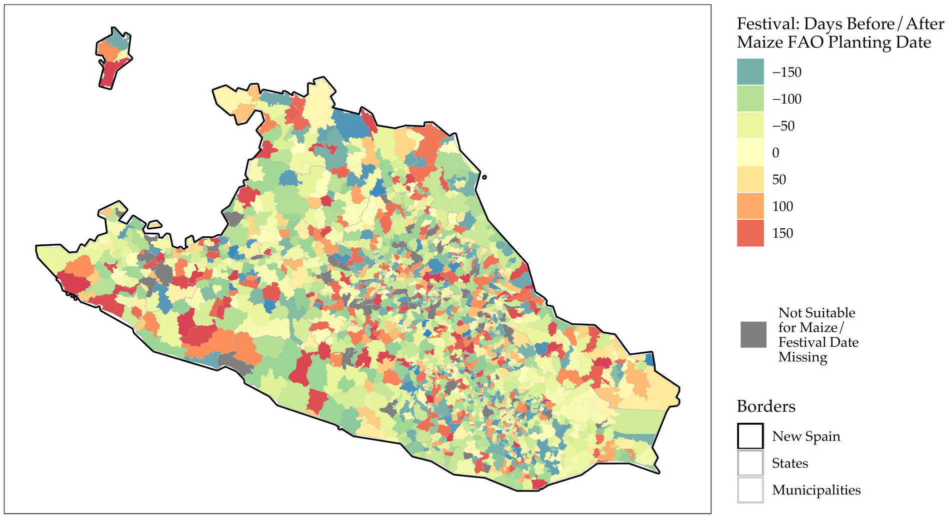
Notes: The map presents the optimal maize planting month according to FAO GAEZ data for each municipality in the New Spain region of Mexico. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

Figure 4: Map of Maize Growth Cycle Length (FAO data) - *New Spain* Region of Mexico



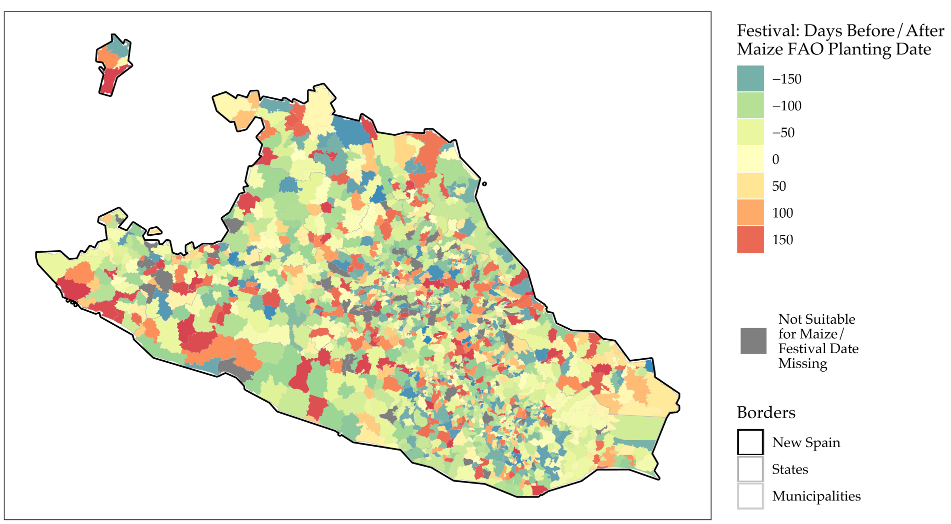
Notes: The map presents the length (in days) of the optimal maize growth cycle according to FAO GAEZ data for each municipality in the New Spain region of Mexico. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

Figure 5: Map of Days Between Festival and Optimal Planting Date - *New Spain* Region of Mexico



Notes: The map presents the difference (in days) between the Catholic saint day festival and the optimal maize planting date (from FAO GAEZ data) for each municipality in the New Spain region of Mexico. (Negative values correspond to festivals that occur before planting; positive values correspond to festivals that occur after planting.) Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

Figure 6: Map of Days Between Festival and Optimal Harvest Date - *New Spain* Region of Mexico



Notes: The map presents the difference (in days) between the Catholic saint day festival and the optimal maize harvest date (from FAO GAEZ data) for each municipality in the New Spain region of Mexico. (Negative values correspond to festivals that occur before harvest; positive values correspond to festivals that occur after harvest.) Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

(8.38%), wheat (5.25%), and groundnuts (0.53%).[26]

4.3. *Data Sources for Development Outcomes*

4.3.1. *Census Data*

We use municipality-level data from the 2010 *Censo de Población y Vivienda* (Population Census henceforth) from Mexico's National Institute of Statistics and Geography (INEGI).[27] This census interviewed over 106 million households across Mexico about their economic well-being, labor supply, asset ownership, and education. We also use municipality-level data on agricultural production from the 2007 *Censo Agrícola, Ganadero y Forestal 2007* (Agricultural Census henceforth). This census includes information on amount of land cultivated, production, and main problems faced by agricultural producers in each municipality.

4.4. *Data on Additional Covariates*

4.4.1. *Geographic Data*

We use several GIS and satellite datasets aside from the FAO GAEZ dataset described in Section 4.2. We use temperature and precipitation data from Global Climate Database (Hijmans et al., 2005) and land suitability measures using data from the Atlas of the Biosphere (Ramankutty et al., 2002). We combine these datasets with the administrative shape file of municipality boundaries for the 2010 population census from the geo-statistics division of INEGI to construct municipality-level covariates. Additionally, we use the municipality shape file to construct municipality area and municipality-centroid latitude and longitude. We describe these geographic datasets and variables in more detail in Appendix A.

4.4.2. *Historical Data*

We use historical measures of population density and climate from Sellers and Alix-Garcia (2018). The population measures during the colonial era were digitized from Gerhard (1993a,b). This source contains various data on the colonial governorships of New Spain, including records from

[26]Maize and groundnuts are crops native to the Americas. Foxtail millet, wetland rice, and wheat are not native to the Americas pre-1500 CE.

[27]For more information on this census, see INEGI documentation.

Spanish administrators on the number of individuals paying tribute to the Spanish Crown.[28] Population measures for 1900 is from Mexican Historical Archive of Localities (AHL), maintained by INEGI. Measures of drought severity during the colonial era are for 1545 and 1570 from the *North American Drought Atlas* (Cook and Krusic, 2004). These measures are important predictors of the dramatic decline in tributary population during the early colonial era and subsequent development (Sellers and Alix-Garcia, 2018).

5. Empirical Strategy

5.1. *Estimating Equation*

In order to examine the economic effects of festival celebrations overlapping with planting and harvest seasons, we estimate the following empirical specification:

$$y_m = \alpha_{s(m)} + \beta \, \textit{Festival: 0-30 Days Prior to Planting}_m + \gamma \, \textit{Festival: 0-30 Days After Harvest}_m + \mathbf{X_m'}\mathbf{B} + \epsilon_m \tag{1}$$

where m indexes municipalities in Mexico; y_m is our outcome of interest; $s(m)$ is a function mapping municipalities to states in Mexico; $\alpha_{s(m)}$ represent state fixed effects to account for all time-invariant differences across states, such as geography or cultural factors that do not vary over time;[29] *Festival: 0-30 Days Prior to Planting*$_m$ is an indicator variable equal to 1 if the saint day festival in municipality m occurs within 0 to 30 days before the optimal maize planting date according to the FAO GAEZ data; *Festival: 0-30 Days After Harvest*$_m$ is an indicator variable equal to 1 if the saint day festival in municipality m occurs within 0 to 30 days after the optimal maize harvest date according to FAO GAEZ data;[30] $\mathbf{X_m}$ is a vector of geographic, climatic, and historical controls for municipality m; and ϵ_m is the error term of municipality m.[31]

The coefficients of interest are β and γ, the effects of having festivals overlap with planting and harvest, respectively. Based on the social science literature on the economic impacts of religious celebrations, we hypothesize that $\beta < 0$ and $\gamma < 0$ when examining long-run development

[28]Unfortunately, there are no other proxies for population for the colonial era. For the tribute data, certain groups – such as indigenous nobility and the clergy – were excempt. See Sellers and Alix-Garcia (2018) on how the tributary data is converted to population measures.

[29]Across Mexico, there are 32 states. In the *New Spain* region of Mexico, there are 13 different states. Section 6.3.2 shows the results using the full sample of Mexican municipalities.

[30]Section 6.2 explores the sensitivity of the results to the definition of the 30-day windows and shows that the results are robust to different windows prior to planting and following harvest.

[31]For municipality-level outcomes, we present robust standard errors. For individual-level outcomes, we cluster standard errors at the municipality level.

differences; that is, having saint day festival expenditures occur in periods when they may crowd out other long term investments and liquidity is low is associated with worse development outcomes.

The main identifying assumption needed to interpret β and γ as the causal impacts of having festivals overlap with planting and harvest is that $E[\epsilon_m | \textit{Festival: 0-30 Days Prior to Planting}_m, \textit{Festival: 0-30 Days After Harvest}_m] = E[\epsilon_m] = 0$. That is, whether a municipality's saint day festival overlaps planting or harvest is exogenous to features of the municipality that could also affect economic development. We provide a number of empirical tests in the following section to examine whether this identifying assumption is valid. However, the measures we use for both festival dates and crop growth cycles also increase confidence that the independent variables of interest are exogenous. First, for festival dates, instead of using the date when the municipality actually celebrates the saint, we use the official patron saint holy date defined on the Roman Catholic Church's calendar for a municipality's patron saint (see Section 4.1). Second, for agricultural seasons, we use estimates from the FAO GAEZ data based on geographic and climate characteristics rather than the dates when households in a municipality perform planting and harvesting, which might be endogenous to levels of economic development. Therefore, using these measures for festivals and agricultural seasons increases confidence that the timing between festivals and the agricultural season is plausibly exogenous to other important characteristics that might affect development.[32]

5.2. *Testing Identifying Assumptions*

One concern with estimating equation (1) is that perhaps saint day festivals were strategically assigned by the Spanish colonizers to avoid the agricultural season in some municipalities, but not in others.[33] This strategic assignment would imply that it would be less likely that municipalities have festivals that coincide with planting or harvest compared to other months. We can test whether municipalities are less likely to have festival days that coincide with planting and harvest in the data by estimating the following relationship:

[32]Additionally, Section 3 provides qualitative historical evidence that saint day festival dates were often chosen due to plausibly exogenous reasons such as the date of conquest and similarities in features between a saint and local gods (but importantly, not on the basis of overlap with agricultural planting or harvest seasons).

[33]For instance, in more populous municipalities, perhaps the Spanish avoided selecting patron saints that would coincide with planting seasons. This would imply that municipalities that happen to have festival coincide with planting or harvest may be less developed today due to omitted variables (e.g. less populous to begin with) rather than the festival directly.

$$\textit{Festival Month}_{mt} = \beta\, \textit{Planting Month}_{mt} + \gamma\, \textit{Harvest Month}_{mt} + \alpha_{s(m)} + \theta_t + \epsilon_{mt} \tag{2}$$

where m indexes municipalities in Mexico and t indexes months of the year; $\textit{Festival Month}_{mt}$ is an indicator variable equal to 1 if the festival for a municipality occurs in that month; $\textit{Planting Month}_{mt}$ is an indicator variable equal to 1 if the optimal maize planting month for a municipality using FAO GAEZ data occurs in that month; $\textit{Harvest Month}_{mt}$ is an indicator variable equal to 1 if the optimal maize harvest month for a municipality using FAO GAEZ data occurs in that month; $\alpha_{s(m)}$ represent state fixed effects; θ_t represent month-of-the-year fixed effects to account for all time-invariant differences across months in the popularity of a saint (for instance, to account for if saints are more likely to have saint days in December according to the Roman Catholic Calendar); and ϵ_{mt} is the error term of municipality m for month t. We cluster standard errors by municipality. If saint day festivals were strategically assigned by the Spanish colonizers in order to avoid the agricultural season, then we would expect that $\beta \neq 0$ and/or $\gamma \neq 0$. However, if the saint day festivals were assigned not taking into account the timing of the agricultural season, then we would expect that $\beta = 0$ and $\gamma = 0$.

Table 1 presents the estimates for equation (2) examining the relationship between festival months and planting and harvest months for maize, the main staple crop in Mexico. Estimates of the coefficients β and γ are consistently small in magnitude and are not statistically significantly different from zero at conventional levels. There is no evidence that festivals are more or less likely to overlap with planting or harvest months. Instead, the estimates suggest that festival dates occur throughout the calendar in a way that is consistent with festival days not being assigned strategically to avoid or coincide with planting and harvest. This is consistent with the idea that the interaction between festival days and planting or harvest is exogenous.

A second concern with equation (1) is that if festivals were assigned exogenously depending on characteristics that might matter for economic development – such as geography and climate – then municipalities that happen to have festivals coincide with planting or harvest would not be comparable to municipalities where this is not the case. If this were the case, then the estimates from equation (1) for our independent variables of interest would not be causal and would instead be capturing impacts of these other differences between municipalities.

To examine whether this is the case, we estimate equation (1) and have the outcome y_m represents a series of important geographic, climatic, and historical characteristics that might

Table 1: Relationship Between Festival, Maize Planting, and Maize Harvest Months

	Dependent Variable: *Festival Month*			
	(1)	(2)	(3)	(4)
Maize Planting Month	0.003	−0.006	−0.006	−0.005
	(0.007)	(0.008)	(0.008)	(0.009)
Maize Harvest Month	0.044***	0.011	0.011	0.008
	(0.009)	(0.010)	(0.010)	(0.010)
Month Fixed Effects	N	Y	Y	N
State Fixed Effects	N	N	Y	N
Month by State Fixed Effects	N	N	N	Y
Observations	19,884	19,884	19,884	19,884
Clusters	1,657	1,657	1,657	1,657
Mean Dep. Var.	0.083	0.083	0.083	0.083

Notes: Observations are at the municipality-month level for Municipalities in Mexico for which we have festival data. Standard errors are clustered at the municipality level. *Festival Month* is an indicator variable equal to 1 if the festival for a municipality occurs in that month. *Maize Planting Month* is an indicator variable equal to 1 if the optimal maize planting month for a municipality using FAO GAEZ data occurs in that month. *Maize Harvest Month* is an indicator variable equal to 1 if the optimal maize harvest month for a municipality using FAO GAEZ data occurs in that month. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

affect development. Table 2 presents the estimates for this exercise. The estimates suggest that, conditional of state fixed effects, municipalities that happen to have festivals coincide with planting or harvest are generally not significantly different than municipalities where this not the case for a number of characteristics that are potentially important for economic development.[34] The findings provide additional suggestive evidence that festivals that overlap with planting or harvest were not assigned based on endogenous characteristics of municipalities and are consistent with the identifying assumption of equation (1).

[34]Note that we do find statistically significant differences in latitude (for planting-overlap) and longitude (for harvest-overlap). Additionally, we find that municipalities where the festival overlaps with harvest have lower drought intensity in 1545 (but we do not find differences drought intensity in 1570, or average rainfall today). However, due to these differences, all subsequent regressions include these controls.

Table 2: Differences Between Municipalities by Whether Festivals Overlap with Planting or Harvest

	Festival: No Overlap with Planting or Harvest		*Festival: 0-30 Days Prior to Maize Planting*		*Festival: 0-30 Days After Maize Harvest*		*T-Test Difference in Means*	
	Obs.	Mean/SE	Obs.	Mean/SE	Obs.	Mean/SE	(1)-(2)	(1)-(3)
Average Rainfall	1449	94.406	82	98.518	126	99.499	-4.112	-5.093
		(1.175)		(6.241)		(4.194)		
Average Temperature	1449	19.090	82	19.862	126	19.225	-0.772	-0.135
		(0.105)		(0.416)		(0.340)		
Land Suitability	1449	0.862	82	0.844	126	0.853	0.018	0.009
		(0.003)		(0.020)		(0.016)		
Maize Suitability	1449	5.131	82	5.043	126	5.264	0.088	-0.133
		(0.040)		(0.170)		(0.146)		
Area	1449	329.215	82	394.502	126	366.650	-65.288	-37.435
		(12.917)		(73.659)		(50.687)		
Longitude	1449	-98.347	82	-98.151	126	-98.367	-0.196**	0.020
		(0.053)		(0.250)		(0.166)		
Latitude	1449	18.675	82	18.647	126	19.024	0.028	-0.349***
		(0.039)		(0.185)		(0.149)		
Drought in 1545	1351	-3.633	70	-3.561	122	-3.487	-0.072	-0.146***
		(0.018)		(0.091)		(0.072)		
Drought in 1570	1253	-4.411	61	-4.497	106	-4.494	0.086	0.083
		(0.029)		(0.158)		(0.112)		
Log(Dist. to Mexico City)	1253	5.232	61	5.304	106	5.279	-0.072	-0.047
		(0.021)		(0.084)		(0.065)		
Log(Pop. Density in 1570)	1253	0.531	61	0.405	106	0.461	0.127	0.070
		(0.032)		(0.129)		(0.103)		
F-test of joint significance (F-stat)							0.585	0.561
F-test, number of observations							1314	1359

Notes: The value displayed for t-tests are the differences in the means across the groups, conditional on state fixed effects. Robust standard errors are presented in parentheses. See Data Appendix for more information on variables. *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs within 0-30 days prior to the optimal maize planting date for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0-30 days after the optimal maize harvest date for that municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6. Results: Differences in Development

6.1. Differences in Development

We now present regression results examining whether having saint day festivals overlap with planting and/or harvest seasons leads to differences in economic development in Mexico. We use data from the 2010 population census to estimate equation (1). To discipline the analysis and avoid data mining and specification search concerns for multiple outcomes, we first construct an index of economic development using all questions in the census related to economic development within a municipality. This includes questions on household income, employment and educational attainment (by gender and for various age-groupings), and asset ownership. We construct the index as the first principal component of these measures of development, and explain the measures used in more detail in Appendix A.

Table 3 presents the estimates for equation (1) for the index of economic development as the dependent variable. Column (1) does not include state fixed effects and columns (2)-(5) include state fixed effects, which is our preferred specification as explained in Section 5. Columns (3) and (4) include additional geographic controls and historical controls, respectively. Column (5) includes planting-month and harvest-month fixed effects to account for potential direct (time-invariant) impacts of having plating/harvest occur at different points in the calendar. The estimates presented in Table 3 show that having a festival coincide with either maize planting or harvest is associated with significantly lower levels of economic development. The estimates suggest that having a festival occur either 0-30 days prior to planting or 0-30 days following harvest is associated with a 0.20 standard deviation decrease in economic development. The results suggest that having a poorly timed festival can lead to lower levels of economic development, potentially because the festivals crowd out additional investment (something we examine in Section 7).

It is of interest to explore what index subcomponents are driving these impacts on the overall index of economic development. We therefore present the estimated effects for all the individual index components in Figure 7. We present the estimated effects for both festivals that overlap with planting (top panel) and harvest (bottom panel). Overall, we find that the vast majority of the sub-compenents are negative and generally statistically significant. When we examine which components tend to have the largest negative effects, we find that having a festival coincide with either maize planting or harvest is associated with significantly lower household income,

Table 3: Development and Festival Overlap with Maize Planting and Harvest

	Dependent Variable: *Index of Economic Development*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Maize Planting	-0.815^{*}	-0.534	-0.614^{**}	-0.697^{**}	-0.861^{***}
	(0.438)	(0.340)	(0.308)	(0.318)	(0.315)
Festival: 0-30 Days After Maize Harvest	-0.825^{**}	-0.711^{**}	-0.761^{***}	-0.808^{***}	-0.809^{***}
	(0.351)	(0.298)	(0.275)	(0.275)	(0.280)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	1,622	1,622	1,622	1,622	1,622
Adjusted R2	0.003	0.357	0.495	0.508	0.518
Mean Dep. Var.	-0.556	-0.556	-0.556	-0.556	-0.556
SD Dep. Var.	4.008	4.008	4.008	4.008	4.008

Notes: Data is from the 2010 Mexico Population Census. Observations are municipalities in Mexico. Robust standard errors are presented in parentheses. *Index of Economic Development* is the first principal component index for a number of development outcomes in the census for a municipality (see Data Appendix). *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

literacy, employment and education. Additionally, we find that planting- and harvest-season festivals are associated with less asset ownership, but the results are less statistically precise for these sub-components. The results in Figure 7 provides evidence for the wide-ranging negative development consequences of poorly timed festivals.

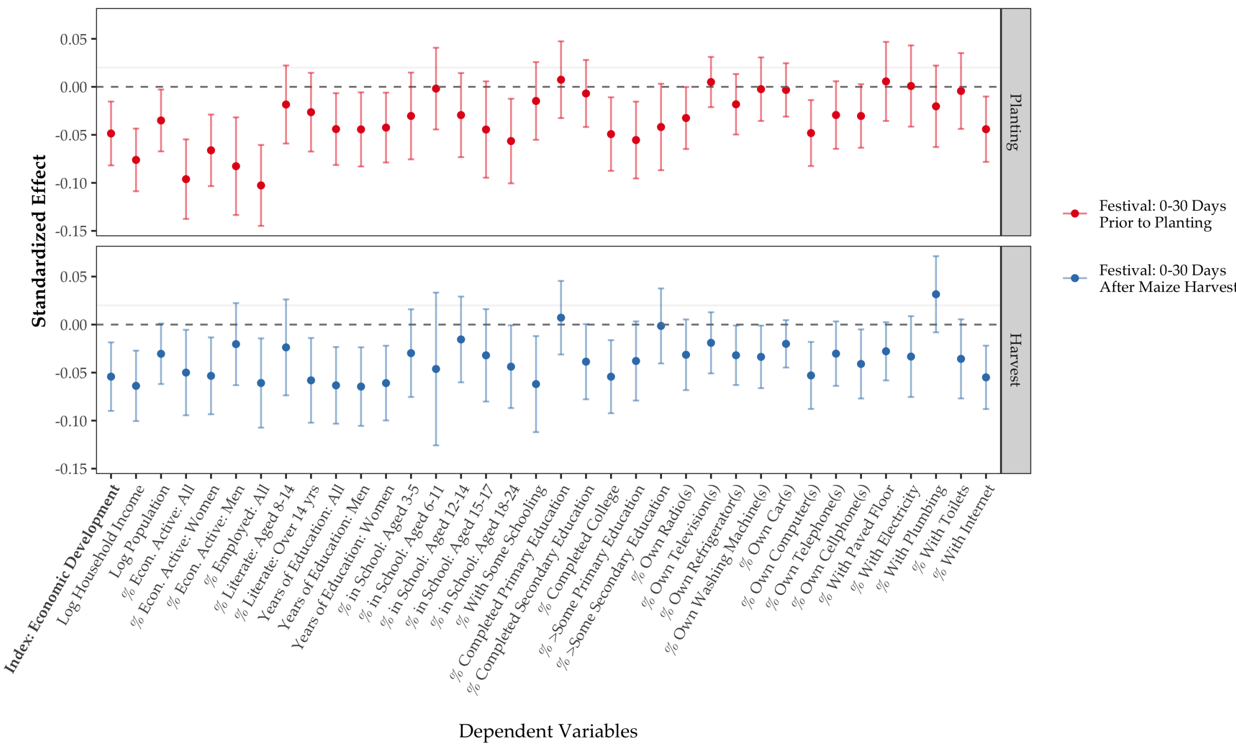
6.2. Impacts by Festival Timing Relative to Planting & Harvest

In this section, we explore the development results further by exploring how the timing of the festival affects development when we examine other periods before and after planting and harvest. We do this in two ways. First, we conduct an exercise examining the impacts of festivals overlapping with other periods relative to planting and harvest months. Second, we explore when during the agricultural seasons that negative impacts of festivals on economic development begin to appear (and then disappear).

First, we examining the impacts of festivals overlapping with other months relative to planting and harvest months. In equation (1) and Section 5 we hypothesize that having a festival overlap with planting/harvest may lead to lower long-run development due to festival expenditures

Figure 7: Development and Festival Overlap with Maize Planting and Harvest:

Estimates for Economic Development Index Components



Notes: Data is from the 2010 Mexico Population Census. The figure presents the estimated β and γ coefficients and respective 95% confidence intervals from estimating equation (1) on the sub-components of the *Index of Economic Development*. The depenent variables are denoted on the x-axis. We first show the estimates for *Index of Economic Development*, followed by estimates for each of the individual sub-components of the index. (See Data Appendix for more information.) textitFestival: 0-30 Days Prior to Maize Planting (top panel) is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* (bottom panel) is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. The regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

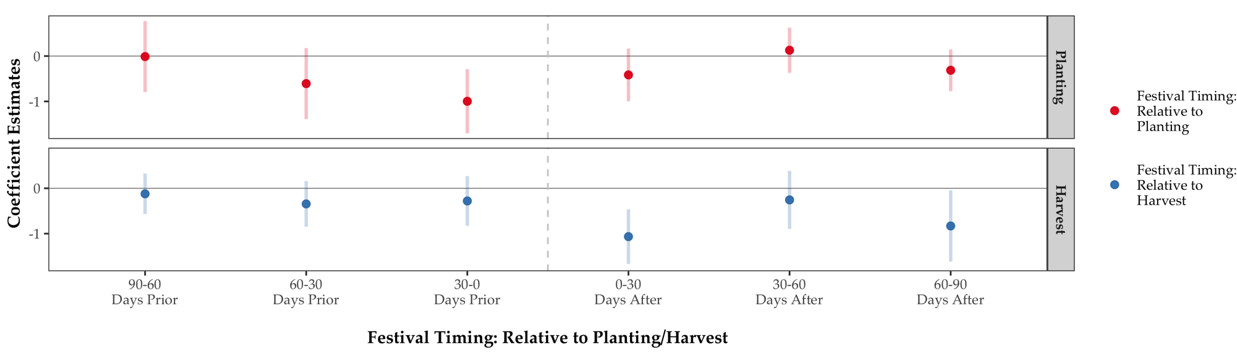
crowding out of investments during low liquidity times. This argument implies that we should see the largest estimated effect when the festival overlaps with planting/harvest, and smaller negative effects for other months near planting/harvest (i.e. 2 months before, 2 months after, 3 months before, etc.). This motivates an exercise where we examine festivals that occur in months leading up and following planting/harvest seasons but that do not coincide with planting/harvest seasons. To conduct this exercise we estimate the following specification:

$$y_m = \alpha_{s(m)} + \sum_{i=-3}^{3} \beta_i \, \textit{Festival: i Months from Planting}_m + \sum_{j=-3}^{3} \gamma_j \, \textit{Festival: j Months from Harvest}_m + \mathbf{X}_{\mathbf{m}}' \mathbf{B} + \epsilon_m \quad (3)$$

where our coefficients of interest are β_i and γ_j, the effect of festivals occurring $i$or j months from planting or harvest, respectively; and other variables are defined as before in equation (1).

Figure 8 presents these estimates of interest from estimating equation (3) on the index of economic development The estimates are consistent with the hypothesis from Section 5; namely, the largest estimated effect occurs when the festival overlaps with the period prior to the planting month or following the harvest month, and smaller negative effects for other months near planting or harvest. These results are consistent with the hypotheses that festivals can crowd out investments when they occur in times of particularly low liquidity.[35]

Figure 8: Impacts of Festival Overlap with Other Months Relative to Planting and Harvest



Notes: Data is from the 2010 Mexico Population Census. The figure presents the estimated β_i and γ_j coefficients and respective 95% confidence intervals from estimating equation (3). The outcome variable is the *Index of Economic Development* (see Data Appendix). *Festival Timing: Relative to Planting/Harvest* is defined as the number of months before/after a municipality celebrates its festival relative to planting (top panel) and harvest (bottom panel) according to FAO GAEZ data. The regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

[35]This timing of the effects highlighted in Figure 8 also provides additional evidence that the results presented in Table 3 are due to the overlap between festivals and planting and are not capturing some other difference between municipalities with/without this overlap that is not related to the festivals themselves.

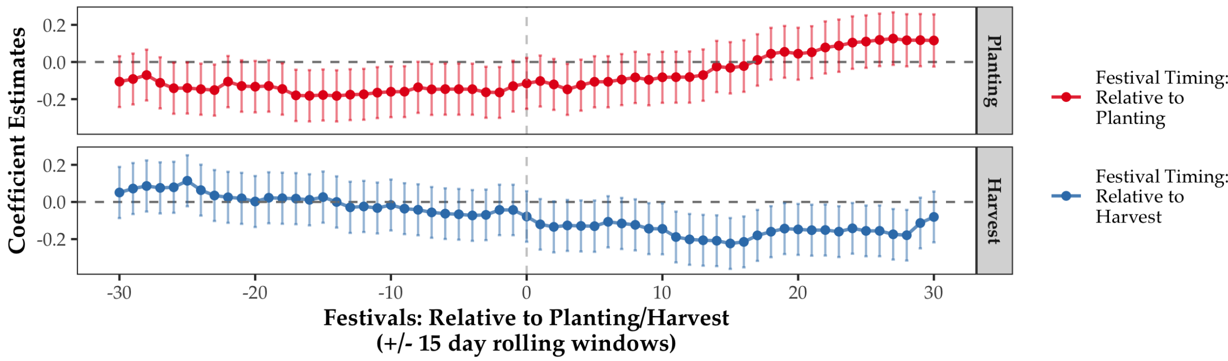
Second, we vary the 30-day window (relative to planting and harvest) used to estimate our main specification and examine when the negative impacts of festivals seem to arise. Specifically, in equation (1), we focus on the periods when having a festival overlap with planting/harvest may lead to lower long-run development: periods when festival expenditures crowding out of investments during low liquidity times. We defined these periods are being 0-30 day prior to planting and 0-30 after harvest. However, there are many other 30-day windows one could use to define these overlap periods. Thus, we conduct an exercise to explore the timing of the main impacts by varying the 30-day window across time and estimating our main impacts. To conduct this exercise we estimate the following specification:

$$y_m = \alpha_{s(m)} + \beta_i \textit{ Festival: } i \pm 15 \textit{ days from Planting}_m + \gamma_i \textit{ Festival: } i \pm 15 \textit{ from Harvest}_m + \mathbf{X}_{\mathbf{m}}^{'}\mathbf{B} + \epsilon_m \quad (4)$$

where our coefficients of interest are β_i and γ_j, the effect of festivals occurring $i \pm 15$ days from planting or harvest for various values of i; and other variables are defined as before in equation (1). In other words, equation (4) estimates our main specification but instead uses various rolling 30-day windows relative to planting and harvest.

Figure 9 presents the coefficient plot for the estimates of interest from estimating equation (4) on the index of economic development used in Table 3. The estimates suggest an interesting time dimension to the impacts of festivals on development. First, the negative estimated effects of festivals overlapping with planting appear for various rolling windows prior to planting but converge toward zero following planting. Second, we observe the opposite timing for harvest festivals: the negative estimated effects of festivals overlapping with harvest only begin to appear following harvest (and are statistically insignificant and close to zero prior to harvest). Additionally, the estimates show that the main results are not particularly sensitive to the specific 30-day window we consider. These results are consistent with the hypotheses that the timing of festivals is important for understanding their development consequences, and that festivals can crowd out investments and decrease development when they occur in times of when time-sensitive investment opportunities exist.

Figure 9: Impacts of Festival Timing Relative to Planting and Harvest Dates



Notes: Data is from the 2010 Mexico Population Census. The figure presents the estimated β_i (top panel) and γ_i (bottom panel) coefficients and respective 95% confidence intervals from estimating equation (4) for $i \in -30{,}30$ days. The outcome variable is the *Index of Economic Development* (see Data Appendix). *Festival :* $i \pm 15$ *days from Planting* (top panel) is an indicator variable equal to 1 if the festival occurs $i \pm 15$ from the optimal planting date according to FAO GAEZ data (where negative values of i means that the festival occurs prior to planting); *Festival :* $i \pm 15$ *days from Harvest* (bottom panel) is an indicator variable equal to 1 if the festival occurs $i \pm 15$ from the optimal harvest date according to FAO GAEZ data (where negative values of i means that the festival occurs prior to harvest). The regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

6.3. *Extensions & Robustness*

In this section, we conduct a number of robustness tests for our main results. First, we show that our results are robust to using the agricultural seasons for the maximum Caloric Suitability Index (CSI) crop within each municipality instead of focusing solely on maize planting and harvest seasons. Second, we show that the results are robust to expanding the sample to include all municipalities in Mexico. Third, we conduct a randomization inference exercise assigning placebo festival dates to show that the estimated impacts are not driven by outliers or observations with high leverage.

6.3.1. *Maximum Calorie Crops*

As explained in Section 4.2, we also consider an alternative measure of how festivals overlap with agricultural seasons. Specifically, instead of examining only maize planting and harvest, we use data from Galor and Ozak (2016) on the Caloric Suitability Index (CSI) for each crop within each municipality to construct measures of the overlap between the festival date and the optimal planting/harvest date of the maximum CSI crop for each municipality. As before, the crop calendar data is from FAO GAEZ. This provides an additional check on the results presented above by considering a measure that examines a larger set of crops instead of just maize.

Table 4 presents the estimates for estimating equation (1) for the index of economic development using the overlap between festival month and optimal planting and harvest months for the maximum CSI crop. The results are similar to the results presented in Table 3 and show that having the festival overlap with planting is associated with significant decreases in economic development.[36]We also replicate the month-by-month analysis from section 6.2 using the CSI measure and present the results in Figure A8. We find that the effect of the overlap between the festival and max csi crop seasons is largest exactly when the festival overlaps with the planting month. These results confirm the findings from the previous section and show that the results are robust to considering alternative crop calendars.

Table 4: Development and Festival Overlap with Max CSI Crop Planting and Harvest

	Dependent Variable: *Index of Economic Development*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Max CSI Planting	-0.438	-0.554	-0.873^{***}	-0.890^{***}	-0.770^{***}
	(0.407)	(0.347)	(0.304)	(0.291)	(0.283)
Festival: 0-30 Days After Max CSI Harvest	0.183	-0.075	-0.490	-0.617^{*}	-0.576^{*}
	(0.417)	(0.370)	(0.344)	(0.339)	(0.342)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	1,656	1,656	1,656	1,656	1,656
Adjusted R2	-0.001	0.356	0.499	0.512	0.523
Mean Dep. Var.	-0.534	-0.534	-0.534	-0.534	-0.534
SD Dep. Var.	3.996	3.996	3.996	3.996	3.996

Notes: Data is from the 2010 Mexico Population Census. Observations are municipalities in Mexico. Robust standard errors are presented in parentheses. *Index of Economic Development* is the first principal component index for a number of development outcomes in the census for a municipality (see Data Appendix). *Festival: Same Month as Max CSI Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal planting month for the maximum CSI crop for a municipality using CSI data from Galor and Ozak (2016). *Festival: Same Month as Max CSI Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal harvest month for the maximum CSI Crop for that municipality. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude, mean maize suitability for the municipality, and fixed effects for the max csi suitability crop. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for the max-CSI crop for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.3.2. Expanding Sample to Include All Mexican Municipalities

For reasons detailed in Section 3, our main results limit the sample to municipalities in the former *New Spain* region of Mexico. In this section, we present our main results expanding the sample

[36]Appendix Table A1 presents the equivalent balance table as in Table 2 and shows the municipalities where the festival overlaps with the max CSI crop's planting or harvest months are similar on important observables as well.

to include all municipalities in Mexico where we could determine the festival date.[37] We present results using the planting and harvest timing of the maximum CSI crop for each municipality used in Section 6.3.1. We present using the maximum CSI crop instead of maize as northern areas of Mexico are less likely to produce maize as its main staple crop compared to other staple crops due to environmental differences.

Table 5 presents the estimates for all municipalities in Mexico from estimating equation (1) for the index of economic development using the overlap between festivals and the optimal planting and harvest months for the maximum CSI crop. We find that the results are very similar to the results presented in Table 3 when we expand our sample to include all municipalities in Mexico. Specifically, we find that having the festival occur prior to planting or shortly after harvest is associated with significant decreases in economic development.[38] These results confirm the findings from the previous section and show that the results are robust to considering an alternative and larger sample.

6.3.3. *Randomization Inference Exercise*

One potential concern with the main results in Table 3 is that they might be driven by outlier municipalities or high-leverage observations. To provide potentially more robust inference, we follow suggestions from Young (2018) and conduct a randomization inference exercise where we randomly assign whether or not a festival in municipality overlaps with planting or harvest months. Specifically, we conduct 10,000 simulations where we randomly assign whether or not a festival overlaps with planting or harvest for each municipality and estimate equation 1. Figure 10 presents the empirical cumulative distribution functions of the estimated t-statistics for all the simulations, and denote the estimated t-statistics from Table 3. We also present the randomization inference p-values in the bottom right of the figures. We find that the estimated t-statistics from Table 3 for having a festival overlap with maize planting or harvest are much larger and more negative than the majority of placebo festival assignments, and that the randomization inference p-values are below 0.01. The results from this randomization inference exercise suggest the estimated impacts of festivals overlapping with planting and harvest are specific to the actual festival dates we observe across Mexico.

[37] See Figure 1 for a map of municipalities in Mexico that were and were not part of *New Spain*.

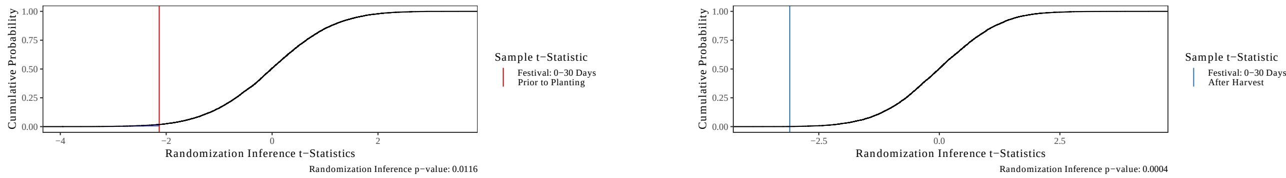
[38] Appendix Table A1 presents the equivalent balance table as in Table 2 and shows the municipalities where the festival overlaps with the max csi crop's planting or harvest months are similar on important observables as well.

Table 5: Development and Festival Overlap with Planting and Harvest: All of Mexico

	Dependent Variable: *Index of Economic Development*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Max CSI Planting	0.072	−0.281	−0.652***	−0.639***	−0.527**
	(0.350)	(0.281)	(0.245)	(0.243)	(0.239)
Festival: 0-30 Days After Max CSI Harvest	0.163	−0.318	−0.575**	−0.634**	−0.624**
	(0.331)	(0.287)	(0.273)	(0.273)	(0.273)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	2,352	2,352	2,352	2,352	2,352
Adjusted R2	-0.001	0.383	0.493	0.500	0.508
Mean Dep. Var.	-0.048	-0.048	-0.048	-0.048	-0.048
SD Dep. Var.	3.964	3.964	3.964	3.964	3.964

Notes: Data is from the 2010 Mexico Population Census. Observations are municipalities in Mexico. Robust standard errors are presented in parentheses. *Index of Economic Development* is the first principal component index for a number of development outcomes in the census for a municipality (see Data Appendix). *Festival: Same Month as Max CSI Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal planting month for the maximum CSI crop for a municipality using CSI data from Galor and Ozak (2016). *Festival: Same Month as Max CSI Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal harvest month for the maximum CSI Crop for that municipality. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude, mean maize suitability for the municipality, and fixed effects for the max csi suitability crop. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for the max-CSI crop for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 10: Randomization Inference Exercise – Placebo Festival-Planting and -Harvest Overlap



(a) Festival-Planting Overlap

(b) Festival-Harvest Overlap

Notes: The figures present the cumulative distribution functions for the estimated t-statistics for the randomization inference exercise. Specifically, we conduct 10,000 simulations where we randomly assign whether or not a festival overlaps with planting (Sub-Figure (a)) or harvest (Sub-Figure (b)) for each municipality and estimate our main specification, and then plot the cumaltive distribution function for the estimated t-statistics. All regressions include state fixed effects, *Geography Controls*, and *Colonial Controls*. Additionally, the figure presents the estimated t-statistic for our sample in red (for planting) and blue (for harvest overlap), and reports the randomization inference p-value on the bottom right of each figure.

7. Mechanisms

The results so far establish that festivals overlapping with planting or harvest lead to lower development outcomes in the long-run. We now explore mechanisms behind this effect. We argue that the impacts of planting- and harvest-season festivals emerge because the both seasons are a time when investment opportunities for for rural households are high. Planting- and harvest-season festivals therefore crowd out these longer-horizon investments. While there may be offsetting increases in social capital stemming from festivals, the net effect of planting- or harvest-season festivals is to compromise long-run growth. To explore the mechanisms for these hypotheses, we conduct a number of empirical tests using IPUMS microdata for the Population Census and maize yield and production data from the *Servicio de Información Agroalimentaria y Pesquera* (SIAP).

7.1. *Industry Employment Shares and Structural Transformation*

We examine the impact of festivals on municipality-level measures of structural transformation guided by the conceptual framework presented in Section 2. Two-sector growth models of structural transformation would predict that lower agricultural productivity (due to having poorly-timed festivals) would lead to less structural transformation out of agriculture. (Herrendorf et al., 2014, Caselli, 2005).

To examine the impact of festivals on industrial structure, we use IPUMS microdata from the 2010 Mexican Population Census. The IPUMS microdata provides a 10 percent random sample of each census and provide population weights for each observation. We use this microdata to construct municipality-level measures of the share of workers in different industries (agriculture, manufacturing, and services), and the share of workers in rural localities (defined in the census as localities with fewer than 2500 individuals). Table 6 presents estimates of the impact of planting and harvest festivals on industrial structure. We find that municipalities where festivals overlap with planting or harvest have a higher share of workers engaging in agriculture and a significantly lower share of workers in services. This is consistent with the prediction that the transition away from agriculture is hampered in areas with lower agricultural productivity (due to having a poorly-timed festival). Relatedly, we find that having festivals overlap with planting or harvest is associated with higher share of the population in rural areas.[39] By inhibiting the development of agriculture, planting and harvest festivals appear to retard the structural transformation of localities out of agriculture and into modern economic sectors.

Table 6: Industry Employment and Festival Overlap with Maize Planting and Harvest Months

	Dependent Variable:			
	% in Agriculture	*% in Manufacturing*	*% in Services*	*% Rural*
	(1)	(2)	(3)	(4)
Festival: 0-30 Days Prior to Maize Planting	0.039^{*}	0.012	-0.048^{***}	0.029
	(0.021)	(0.014)	(0.018)	(0.037)
Festival: 0-30 Days After Maize Harvest	0.039^{**}	-0.011	-0.026^{*}	0.063^{**}
	(0.018)	(0.007)	(0.015)	(0.030)
State Fixed Effects	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y
Colonial Controls	Y	Y	Y	Y
Planting-Month Fixed Effects	Y	Y	Y	Y
Harvest-Month Fixed Effects	Y	Y	Y	Y
Observations	1,621	1,621	1,621	1,621
Adjusted R2	0.448	0.215	0.405	0.346
Mean Dep. Var.	0.412	0.114	0.468	0.621

Notes: Data is from the 2010 Population Censuses. Observations are municipalities in Mexico. Standard errors are clustered at the municipality level. *% in Agriculture* is the share of workers in a municipality who work in agriculture. *% in Manufacturing* is the share of workers in a municipality who work in manufacturing. *% in Services* is the share of workers in a municipality who work in the service industry. *% Rural* is the share of individuals in a municipality who reside in rural locations (defined as as localities with 2,500 or fewer inhabitants). *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[39] Both coefficients in column 4 are positive, but only the coefficient for harvest festivals is statistically significant at conventional levels.

7.2. *Agricultural Productivity*

We next examine whether there are significant differences in agricultural productivity between municipalities where festivals coincide with planting and harvest compared to other municipalities. One important implication of the conceptual framework discussed in Section 2 (and the structural transformation results in Section 7.1) is that the remaining agricultural sector in municipalities where where festivals coincide with planting and harvest should be both larger and less productive. We test whether municipalities where festivals coincide with planting and harvest have lower maize yields compared to other municipalities using data from the *Servicio de Información Agroalimentaria y Pesquera* (SIAP). Table 7 presents the estimates for how festivals overlapping with planting and harvest affect maize yields. We find that municipalities where festivals overlap with planting or harvest have lower agricultural productivity: having festivals that coincide with planting or harvest is associated with an 0.12 or 0.15 standard deviation lower maize yields, respectively. Consistent with the conceptual framework discussed in Section 2, we find that festivals that overlap with planting and harvest have lower agricultural productivity, limiting the structural transformation of municipalities and their long-run economic development.

Table 7: Maize Productivity and Festival Overlap with Maize Planting and Harvest

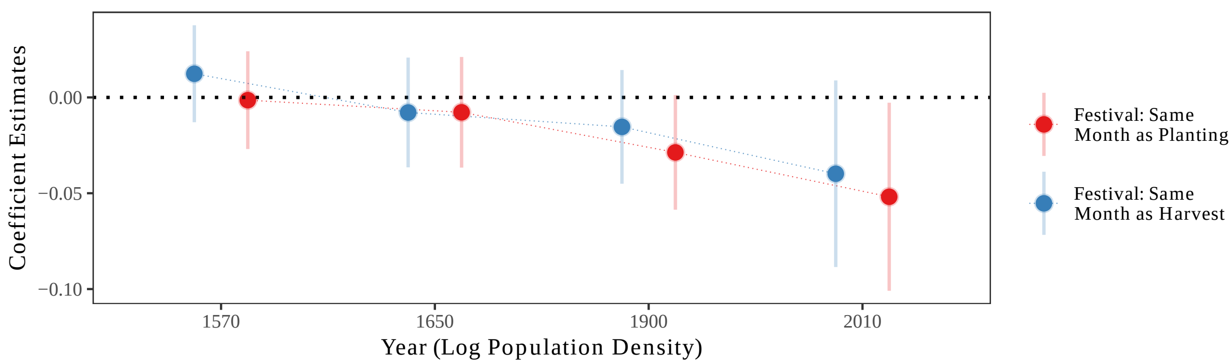
	Dependent Variable: *Maize Yield*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Maize Planting	-1.979^{**}	-1.084	-1.336^{*}	-1.345^{*}	-1.080
	(0.811)	(0.724)	(0.723)	(0.748)	(0.752)
Festival: 0-30 Days After Maize Harvest	-2.135^{***}	-1.478^{***}	-1.714^{***}	-1.655^{***}	-1.344^{**}
	(0.650)	(0.563)	(0.587)	(0.596)	(0.603)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	1,605	1,605	1,605	1,605	1,605
Adjusted R2	0.003	0.257	0.309	0.316	0.322
Mean Dep. Var.	5.438	5.438	5.438	5.438	5.438
SD Dep. Var.	10.922	10.922	10.922	10.922	10.922

Notes: Data is from the *Servicio de Información Agroalimentaria y Pesquera* (SIAP) for 2010. Observations are municipalities in Mexico. Robust standard errors are presented in parentheses. *Maize Yield* is the mean maize yield in tons per hectare for a municipality in 2010. *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7.3. *Development Across Time*

The results so far highlight that festivals overlapping with planting season are associated with worse development outcomes, and that these effects are driven by less structural transformation. We now explore the question of when these differences in development emerged. We use historical measures of economic development across municipalities of Mexico from Sellers and Alix-Garcia (2018) to ask at what point in time the effects of festivals overlapping with planting/harvest may have emerged. We use data on population density across municipalities in Mexico in 1570, 1650, 1900, and today, and plot the coefficients for the effect of festivals overlapping with planting and harvest on these measures in Figure 11.[40]

Figure 11: Effect of Festivals Across Time - Coefficient Plot for Population Density Measures



Notes: Data on log population density for 1570, 1650, and 1900 is from Sellers and Alix-Garcia (2018). Data on population density for 2010 is from the 2010 Mexico Population Census. The figure presents the estimated β and γ coefficients and respective 95% confidence intervals from estimating equation (1) for various measures of log population density across time. Coefficients in blue correspond to the effect of *Festival: Same Month as Maize Planting* – indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal maize planting month for that municipality using FAO GAEZ data. Coefficients in red correspond to the effect of*Festival: Same Month as Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs during the same month as the optimal maize harvest month for that municipality using FAO GAEZ data. The regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

We find that having festivals overlap with planting is associated with lower population density across time. In terms of the effects across time, we find that the differences are not statistically significant and not precisely estimated for the early stages of colonization but become more negative and statistically significant across time, suggesting divergence across time. However, the results are suggestive that the impacts of festival timing (in particular, of planting festival timing) on development have been widening since the early period of the Spanish colonization of Mexico. The impacts we see on present-day outcomes demonstrate divergence across time –

[40]Note that our index of economic development from the 2010 census includes population density as well. See Appendix A for more information.

especially following industrialization – and suggest possible compounding of effects over time on the development trajectories of Mexican municipalities.

8. Religiosity and Income Inequality

We now explore how festivals overlapping with planting and harvest affect religiosity and income equality.

8.1. Religiosity

To examine the impact of festivals on religiosity, we use survey data from the Americasbarometer from 2004 to 2018. To examine differences in religiosity, we construct an index from three questions related to religiosity: the importance of religion to an individual, church attendance, and religious group attendance. First, for the importance of religion question, the survey asks how important religion is to a respondent. Second, for church attendance, the surveys ask how frequently an individual goes to church. Finally, for religious group attendance, the survey asks respondents how frequently an individual participates in religious group meetings. We define our religiosity index as the first principal component of these three religion questions. We explain the questions used in more detail in Appendix A.[41]

Table 8 presents the estimates for how festivals overlapping with planting and harvest affect religiosity, while Table 9 presents the estimates for the individual components of the religiosity index. We find that municipalities where festivals overlap with planting and harvest have higher levels of religiosity. Additionally, we find that the effects on religiosity hold for each of the index components (see Table 9).

[41]Note that these are the full set of religion questions in the LAPOP surveys; however, they were not asked in every wave consistently. Therefore, our index is only defined for survey waves in which all three questions were present. However, we show in Table 9 that the results hold for each individual component when we include all waves that asked each question.

Table 8: Religiosity Index and Festival Overlap with Maize Planting and Harvest

	Dependent Variable: *Religiosity Index*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Maize Planting	0.447	0.494**	0.318*	0.297*	0.295*
	(0.305)	(0.213)	(0.189)	(0.177)	(0.169)
Festival: 0-30 Days After Maize Harvest	0.114*	0.184**	0.125	0.157	0.282**
	(0.065)	(0.082)	(0.099)	(0.102)	(0.108)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	2,809	2,809	2,809	2,809	2,809
Clusters	128	128	128	128	128
Adjusted R2	0.272	0.276	0.278	0.281	0.282
Mean Dep. Var.	0.021	0.021	0.021	0.021	0.021
SD Dep. Var.	1.331	1.331	1.331	1.331	1.331

Notes: Data is from the Americas Barometer (LAPOP) data. Observations are individuals in municipalities in Mexico. Standard errors are clustered at the municipality level. *Religiosity Index* is the first principal component of the following variables: *Importance of Religion*, *Church Attendance*, and *Religious Group Attendance*. *Importance of Religion* is a 1-4 categorical variable that measures how important religion is to a repsondent, ranging from 1="Not Important at All" to 4="Very Important". *Church Attendance* is a 1-5 categorical variable that measures how frequently an individual goes to church, ranging from 1="Never" to 5="More than Once a Week". *Religious Group Attendance* is a 1-4 categorical variable that measures how frequently an individual participates in religious group meetings, ranging from 1="Never" to 4="Once a Week". *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. All regressions controls for respondent age, age squared, gender, and ethnicity, and include locality-size fixed effects. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Religiosity Index, Components, and Festival Overlap with Maize Planting and Harvest

	Dependent Variable:			
	Religiosity Index	*Importance*	*Church Attendance*	*Meeting Attendance*
	(1)	(2)	(3)	(4)
Festival: 0-30 Days Prior to Maize Planting	0.295*	0.214	0.114	0.239*
	(0.169)	(0.152)	(0.221)	(0.135)
Festival: 0-30 Days After Maize Harvest	0.282**	0.149*	0.164	0.113
	(0.108)	(0.076)	(0.150)	(0.070)
State Fixed Effects	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y
Colonial Controls	Y	Y	Y	Y
Planting-Month Fixed Effects	Y	Y	Y	Y
Harvest-Month Fixed Effects	Y	Y	Y	Y
Observations	2,809	3,553	3,567	4,277
Clusters	128	128	128	155
Adjusted R2	0.282	0.271	0.121	0.266
Mean Dep. Var.	1.000	0.791	0.995	0.659
SD Dep. Var.	0.000	0.407	0.069	0.474

Notes: Data is from the Americas Barometer (LAPOP) data. Observations are individuals in municipalities in Mexico. Standard errors are clustered at the municipality level. *Religiosity Index* is the first principal component of the following variables: *Importance of Religion*, *Church Attendance*, and *Religious Group Membership*. *Importance of Religion* is a 1-4 categorical variable that measures how important religion is to a repsondent, ranging from 1="Not Important at All" to 4="Very Important". *Church Attendance* is a 1-5 categorical variable that measures how frequently an individual goes to church, ranging from 1="Never" to 5="More than Once a Week". *Religious Group Membership* is a 1-4 categorical variable that measures how frequently an individual participates in religious group meetings, ranging from 1="Never" to 4="Once a Week". *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. All regressions controls for respondent age, age squared, gender, and ethnicity, and include locality-size fixed effects. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Why would festivals that overlap with planting or harvest be associated with higher religiosity? As discussed in Section 2, lower economic development resulting from poorly-timed festivals might also slow the secularization process and increase religiosity. This increase in religiosity could help explain why poorly-timed festivals persist: more religious communities may hold more tightly to their religious traditions and put up more resistance to changing them, even if they recognized their negative economic consequences.

8.2. *Inequality*

We also investigate the impact of poorly-timed festivals on income inequality. As economic growth typically coincides with increases in income inequality, we may very well expect that poorly-timed festivals may reduce inequality.

We use IPUMS microdata from the 2010 Mexican Population Census to construct municipality-level measures of income inequality. The IPUMS microdata provides a 10 percent random sample of each census and provides population weights for each observation. We construct measures of the inter-quartile range (IQR) of earned income for individuals in a municipality, where earned income is defined as an individual's total income from their labor (from wages, a business, or a farm) in the previous month.

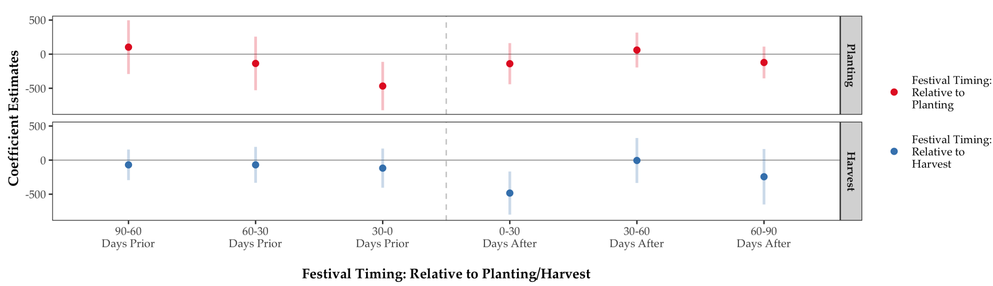
Table 10 presents regression estimates on how festivals overlapping with planting and harvest affect income inequality. We find that municipalities where festivals overlap with planting or harvest have lower levels of income inequality. Similarly, Figure 12 presents the estimates on income inequality of the timing of the festival month relative to planting and harvest month from estimating equation (refeq:falsification). As in Section 6.2, we find that the largest estimated effect on inequality occurs when the festival overlaps with the planting or harvest month, and smaller negative effects for other months near planting or harvest. Our findings that poorly-timed festivals lead to both lower development and less inequality suggest an equity-efficiency tradeoff in this context (e.g. Kuznets, 1955, Robinson and Acemoglu, 2002).

Table 10: Income Inequality and Festival Overlap with Maize Planting and Harvest Months

	Dependent Variable: *IQR of Earned Incomes*				
	(1)	(2)	(3)	(4)	(5)
Festival: 0-30 Days Prior to Maize Planting	-378.21^{*}	-214.27	-293.07^{**}	-345.72^{**}	-425.15^{***}
	(196.72)	(146.47)	(137.99)	(136.48)	(135.85)
Festival: 0-30 Days After Maize Harvest	-396.31^{***}	-367.15^{***}	-387.17^{***}	-392.82^{***}	-418.19^{***}
	(144.67)	(132.26)	(127.84)	(128.85)	(129.77)
State Fixed Effects	N	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y
Colonial Controls	N	N	N	Y	Y
Planting-Month Fixed Effects	N	N	N	N	Y
Harvest-Month Fixed Effects	N	N	N	N	Y
Observations	1,655	1,655	1,655	1,655	1,655
Adjusted R2	0.004	0.351	0.453	0.466	0.487
Mean Dep. Var.	2,203	2,203	2,203	2,203	2,203

Notes: Data is from the 2010 Mexico Population Censuses from IPUMS. Observations are municipalities in Mexico. Standard errors are clustered at the municipality level. *IQR of Earned Incomes* measures the inter-quartile range of individuals total income from their labor (from wages, a business, or a farm) in the previous month for individuals residing in a given municipality. *Festival: 0-30 Days Prior to Maize Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days prior to optimal maize planting month for that municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0 to 30 days after the optimal maize harvest month for that municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545, drought intensity in 1570, log population density in 1570, and the log distance from Mexico City using data from Sellers and Alix-Garcia (2018). *Planting & Harvest Month Fixed Effects* includes fixed effects for the optimal planting-month and harvest-month for maize for each municipality according to FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 12: Examining Impacts on Inequality of Festival Overlap by Months Relative to Planting and Harvest



Notes: Data is from the 2010 Mexico Population Censuses from IPUMS. The figure presents the estimated β_i and γ_j coefficients and respective 95% confidence intervals from estimating equation (3). The outcome variable is the *IQR of Earned Incomes* – the inter-quartile range of individuals total income from their labor (from wages, a business, or a farm) in the previous month for individuals residing in a given municipality. *Festival Timing: Relative to Planitng/Harvest* is defined as the number of months before/after a municipality celebrates its festival relative to planting (top panel) and harvest (bottom panel) according to FAO GAEZ data. The regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

9. Conclusion

In this paper, we examine whether religious festivals promote or hamper economic development by examining Catholic saint day festivals in Mexico. To do so, we create a dataset of festival dates across Mexico using archival sources supplemented by interviews with municipal governments. Our empirical approach exploits variation in the timing of festival dates and agricultural seasons across localities.

We find that festivals overlapping with the agricultural planting or harvest period lead to significantly worse development outcomes in the long run. We argue that this is because festival expenditures crowd out agricultural investments, reducing agricultural productivity and slowing the structural transformation process. However, festivals overlapping with planting or harvest are also associated with higher religiosity. This latter finding may explain why planting festivals have persisted in spite of their negative effects on development.

These results have implications for development policy broadly, as festival expenditures are a common and prominent feature of the lives of the poor (Banerjee and Duflo, 2011). The findings in this paper provide an economic justification for policies that seek to increase liquidity for households around religious festivals. For instance, in many countries with large Christian populations, employers withhold a portion of employee salaries and disburse a "holiday bonus" or "thirteenth salary" in December (Globalization Partners, 2019) to create liquidity for Christmas celebration expenses. These types of policies may have important economic effects and reduce investment crowd-out when households are liquidity-constrained and face religious festival expenses.

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Appendix for

Religious Festivals and Economic Development: Evidence from Catholic Saint-Day Celebrations in Mexico

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2 October 2020

Contents

Appendix A. Data Appendix

A.1. Geographic Data and Variables

- **Precipitation and Temperature:** Precipitation and temperature data is provided by the Global Climate Database created by Hijmans et al. (2005) and available at http://www.worldclim.org/. This data provides monthly average rainfall in millimeters. We calculate the average rainfall for each month in each municipality and average this over the twelve months to obtain our yearly precipitation measure in millimeters of rainfall per year. Similarly, we calculate the average temperature for each month in each municipality and average this over the twelve months to obtain our yearly temperature measure in centigrades.
- **Land Suitability:** Land suitability is the soil component of the land quality index created by the Atlas of the Biosphere available at http://www.sage.wisc.edu/iamdata/ used in Michalopoulos (2012) and Ramankutty et al. (2002). This data uses soil characteristics (namely soil carbon density and the acidity or alkalinity of soil) and combines them using the best functional form to match known actual cropland area and interpolates this measure to be available for most of the world at the 0.5 degree in latitude by longitude level. This measure is normalized to be between 0 and 1, where higher values indicate higher soil suitability for agriculture.

A.2. Mexico Census Data and Indexes

- **Population Census:** We use municipality-level data from the 2010 *Censo de Población y Vivienda* produced by the National Institute of Statistics and Geography (INEGI) of Mexico. For more information on this census, see INEGI documentation at https://www.inegi.org.mx/programas/ccpv/2010/. This census interviewed over 106 million households across Mexico about their economic well-being, labor supply, asset ownership, and education. We construct an index of economic development using all questions in the census related to economic development within a municipality. We construct the index as the first principal component of these measures of development. Figure 7 presents the components of this index. The index includes all questions on educational attainment, workforce participation, literacy, asset and ownership. We list each index component and its definition below:
  - **Log Population:** This measures the log of the number of inhabitants for each municipality in 2010.
  - **Log Household Income:** To construct a measure of household income, we use the IPUMS 10% sample and take the log of each adult respondent's household income.[42] We then construct the average for each municipality.
  - **% Economically Active:** Share of a municipality's population that is "economically active", defined by INEGI as: in a given reference week (e.g. previous week), an individual over 12 years of age performed any work (including informal work), had a job but did not work, or were actively looking for work.
  - **% Economically Active - Men:** Share of a municipality's population of men over 12 years of age that is economically active.

[42] The INEGI municipality-level extract does not include this, but we were able to construct this using the IPUMS extract.

– **% Economically Active - Women:** Share of a municipality's population of women over 12 years of age that is economically active.

– **% Employed:** Share of a municipality's population that is "economically occupied", defined by INEGI as: in a given reference week, an individual over 12 years of age performed any work (including informal work) or had a job but did not work.

– **% Literate - Aged 8-14:** Share of a municipality's population of individuals aged between 8 and 14 years that know how to read and write.

– **% Literate - Aged over 14 Years:** Share of a municipality's population of individuals aged over 14 years that know how to read and write.

– **Average Years of Education - All:** Average years of education for a municipality's population aged over 15 years.

– **Average Years of Education - Men:** Average years of education for a municipality's population of men aged over 15 years.

– **Average Years of Education - Women:** Average years of education for a municipality's population of women aged over 15 years.

– **% in School - Aged 3-5:** Share of a municipality's population of children between the ages of 3 and 5 that attend at least some school in a year.

– **% in School - Aged 6-11:** Share of a municipality's population of children between the ages of 6 and 11 that attend at least some school in a year.

– **% in School - Aged 12-14:** Share of a municipality's population of individuals between the ages of 12 and 14 that attend at least some school in a year.

– **% in School - Aged 15-17:** Share of a municipality's population of individuals between the ages of 15 and 17 that attend at least some school in a year.

– **% in School - Aged 18-24:** Share of a municipality's population of individuals between the ages of 18 and 24 that attend at least some school in a year.

– **% with Some Schooling:** Share of a municipality's population over 15 years of age that has attended at least some schooling in their lifetime.

– **% Completed Primary Education:** Share of a municipality's population over 15 years of age that has completed primary education (6 years).

– **% Completed Secondary Education:** Share of a municipality's population over 15 years of age that has completed secondary education. (3 additional years)

– **% Completed College:** Share of a municipality's population over 18 years of age that has completed any form of post-secondary schooling.

– **% with At Least Some Primary Education:** Share of a municipality's population over 15 years of age that has at least attended and completed some primary education (>0 years of schooling).

– **% with At Least Some Secondary Education:** Share of a municipality's population over 15 years of age that has at least attended and completed some secondary education (>6 years of schooling).

– **% Own Radio(s):** Share of a municipality's households that own at least one radio.

– **% Own Television(s):** Share of a municipality's households that own at least one television.

– **% Own Refrigerator(s):** Share of a municipality's households that own at least one refrigerator.

- **% Own Washing Machine(s):** Share of a municipality's households that own at least one washing machine.
- **% Own Car(s):** Share of a municipality's households that own at least one car.
- **% Own Computer(s):** Share of a municipality's households that own at least one computer.
- **% Own Telephone(s):** Share of a municipality's households that own at least one telephone (landline).
- **% Own Cellphone(s):** Share of a municipality's households that own at least one cellphone.
- **% with Paved Floor:** Share of a municipality's households that have non-dirt floors in their households (e.g. cement, wood, tiled, or other).
- **% with Electricity:** Share of a municipality's households that have access to electric-powered light at their home.
- **% with Plumbing:** Share of a municipality's households that have water accessed through plumbing from the government ("public network") in their home.
- **% with Toilets:** Share of a municipality's households that have toilets at their home.
- **% with Internet:** Share of a municipality's households that have access to the internet at their home.

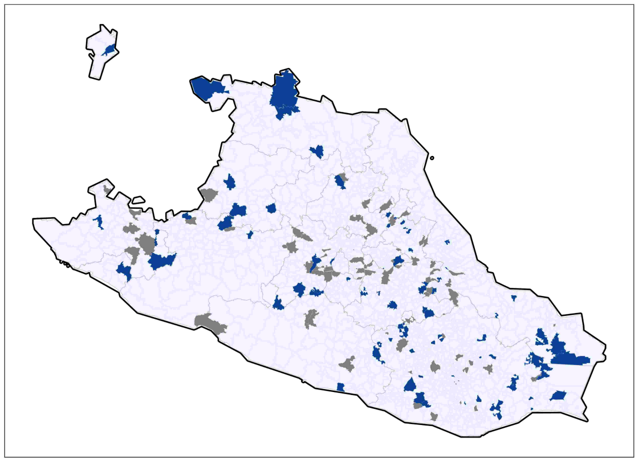
A.3. Americasbarometer (LAPOP) Data and Indexes

- **Data:** we use survey data from the Americasbarometer from 2004 to 2018. To examine differences in religiosity, we construct an index from three questions related to religiosity: the importance of religion to an individual, church attendance, and religious group attendance. We construct our index as the first principal component of these questions; we describe each question/component below.
  - **Importance of Religion:** is a 1-4 categorical variable that measures how important religion is to a repsondent, ranging from 1="Not Important at All" to 4="Very Important".
  - **Church Attendance:** is a 1-5 categorical variable that measures how frequently an individual goes to church, ranging from 1="Never" to 5="More than Once a Week".
  - **Religious Group Attendance:** is a 1-4 categorical variable that measures how frequently an individual participates in religious group meetings, ranging from 1="Never" to 4="Once a Week".

Appendix B. Additional Maps

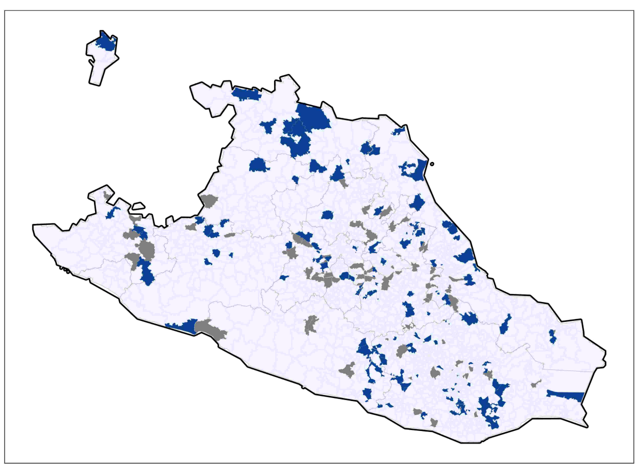
B.1. Additional Maps – New Spain

Figure A1: Map of Municipalities with Festival Month and Optimal Planting Date Overlap
New Spain Region of Mexico



Notes: The map presents whether the month that each municipality in the *New Spain* region of Mexico celebrates its respective Catholic Saint-Day festival falls 0-30 day prior to the optimal maize planting date according to FAO GAEZ data. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

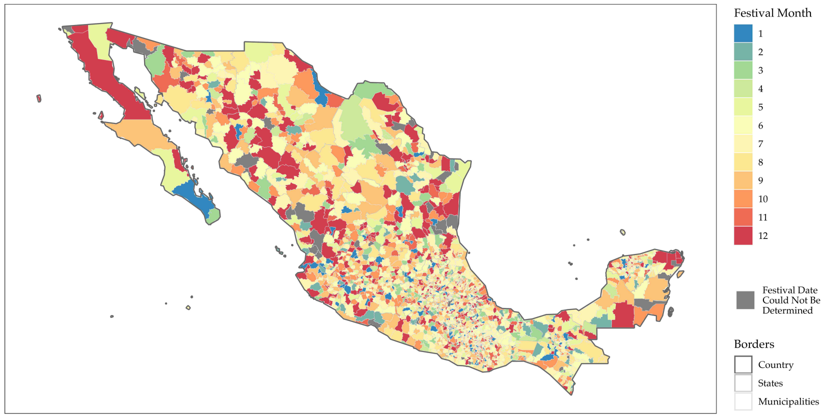
Figure A2: Map of Municipalities with Festival Month and Optimal Harvest Date Overlap
New Spain Region of Mexico



Notes: The map presents whether the month that each municipality in the *New Spain* region of Mexico celebrates its respective Catholic Saint-Day festival falls 0-30 day after the optimal maize harvest date according to FAO GAEZ data. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for the New Spain region of colonial Mexico as defined by Gerhard (1993a) in black and the modern borders of States and Municipalities in gray.

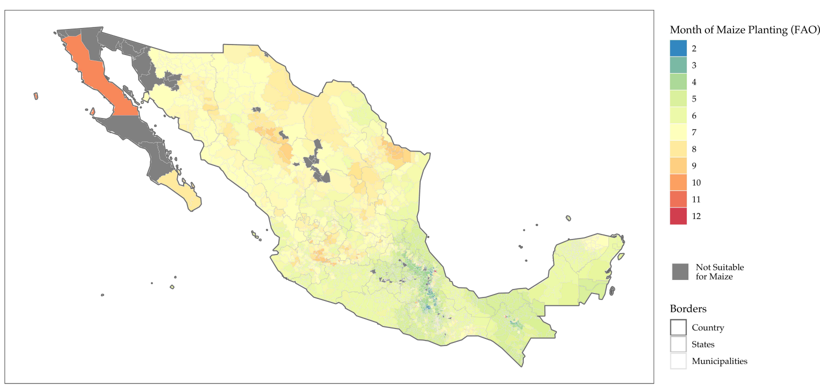
B.2. Additional Maps – All of Mexico

Figure A3: Map of Saints Days - All of Mexico



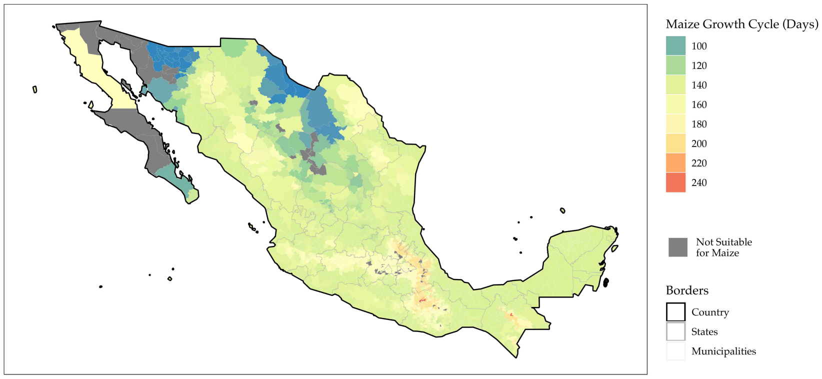
Notes: The map presents the month that each municipality in Mexico celebrates its respective Catholic Saint-Day festival. Section 4.1 describes the construction of the festival date dataset. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for Mexico in black and the borders of States and Municipalities in gray.

Figure A4: Map of Optimal Maize Planting Date (FAO data)



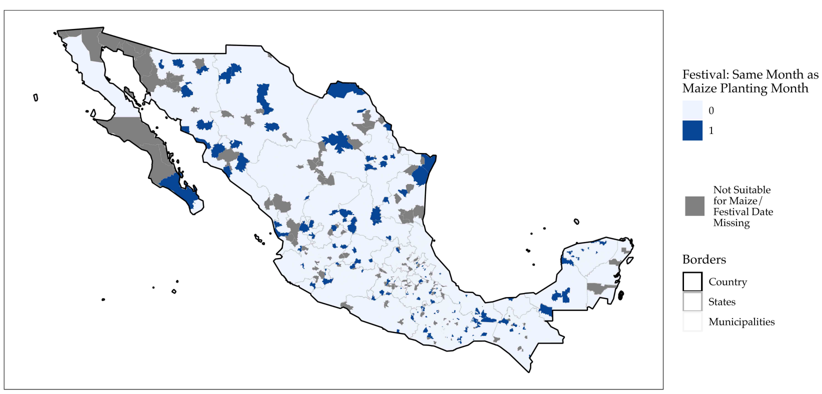
Notes: The map presents the optimal maize planting month according to FAO GAEZ data for each municipality in Mexico. Additionally, the map presents the border for Mexico as in black and the borders of States and Municipalities in gray.

Figure A5: Map of Maize Growth Cycle Date (FAO data)



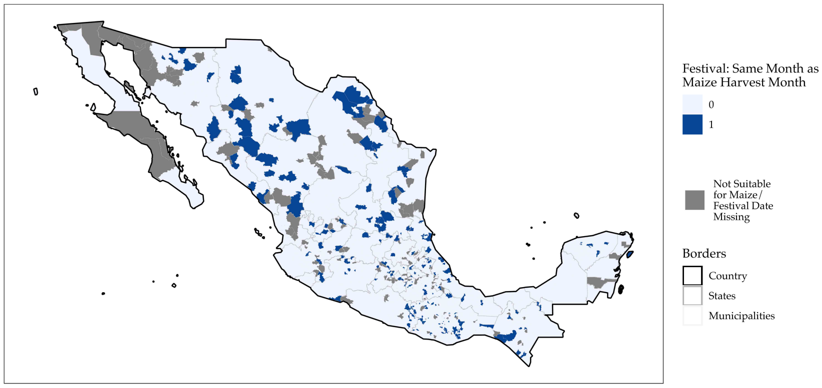
Notes: The map presents the length (in days) of the optimal maize growth cycle according to FAO GAEZ data for each municipality in Mexico. Additionally, the map presents the border for Mexico in black and the borders of States and Municipalities in gray.

Figure A6: Map of Municipalities with Festival Month and Optimal Planting Date Overlap



Notes: The map presents whether the month that each municipality in Mexico celebrates its respective Catholic Saint-Day festival falls 0-30 day prior to the optimal maize planting date according to FAO GAEZ data. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for Mexico in black and the borders of States and Municipalities in gray.

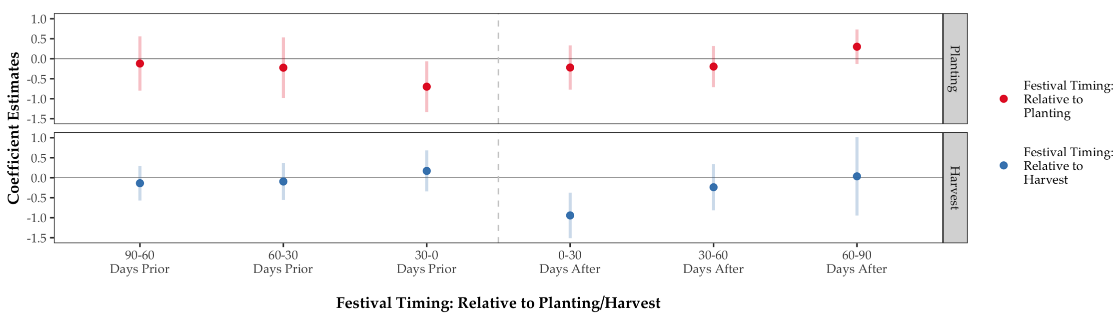
Figure A7: Map of Municipalities with Festival Month and Optimal Harvest Date Overlap



Notes: The map presents whether the month that each municipality in Mexico celebrates its respective Catholic Saint-Day festival falls 0-30 day after the optimal maize harvest date according to FAO GAEZ data. Municipalities where we were unable to determine the festival date are shaded in dark grey. Additionally, the map presents the border for Mexico in black and the borders of States and Municipalities in gray.

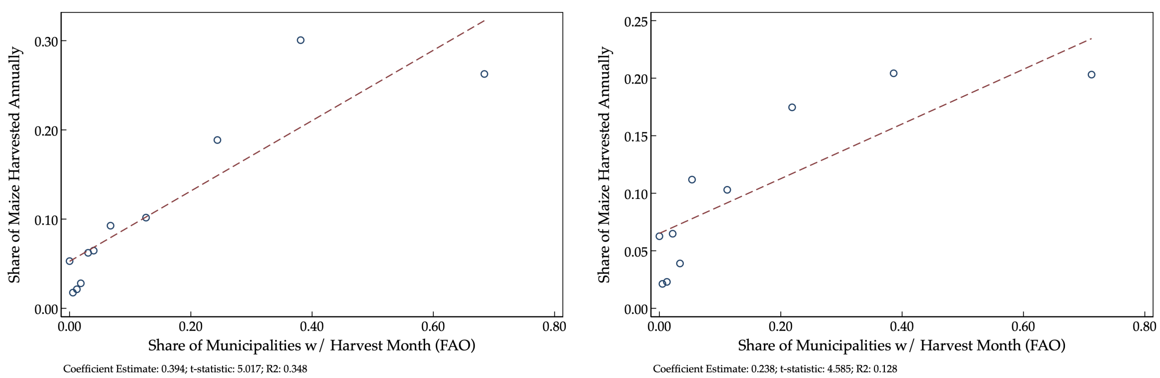
Appendix C. Additional Figures

Figure A8: Falsification Exercise Examining Placebo Month Overlaps for Max CSI Crop



Appendix D. Additional Tables

Figure A9: Validating FAO Maize Crop Calendar Data:
Relationship Between FAO Predicted Maize Harvest Timing and Actual Maize Harvest



a. *New Spain* Region b. All of Mexico

Notes: The figure presents binscatters between the share of a state's total maize harvest that occurs on a given month and the share of municipalities in a state that have their maize harvest on a given month according to the FAO GAEZ data. The unit of observation is a state-month pair. State harvest data is from the*Servicio de Información Agroalimentaria y Pesquera (SIAP)* for 2015. The bottom-right of each figure presents the estimated bivariate coefficient, t-statistic, and R^2. Standard errors are clustered at the state level.

Table A1: Differences Between Municipalities by Whether Months Overlap with Max CSI Planting or Harvest Months

	Festival: No Overlap with Max CSI Crop Planting or Harvest		*Festival: 0-30 Days Prior to Max CSI Crop Planting*		*Festival: 0-30 Days After Max CSI Crop Harvest*		*T-Test Difference in Means*	
	Obs.	Mean/SE	Obs.	Mean/SE	Obs.	Mean/SE	(1)-(2)	(1)-(3)
Average Rainfall	1448	94.423	82	98.518	126	99.499	-4.094	-5.075
		(1.176)		(6.241)		(4.194)		
Average Temperature	1448	19.094	82	19.862	126	19.225	-0.768	-0.131
		(0.105)		(0.416)		(0.340)		
Land Suitability	1448	0.862	82	0.844	126	0.853	0.018	0.009
		(0.003)		(0.020)		(0.016)		
Maize Suitability	1448	5.129	82	5.043	126	5.264	0.086	-0.135
		(0.040)		(0.170)		(0.146)		
Area	1448	329.356	82	394.502	126	366.650	-65.147	-37.294
		(12.925)		(73.659)		(50.687)		
Longitude	1448	-98.347	82	-98.151	126	-98.367	-0.196**	0.020
		(0.053)		(0.250)		(0.166)		
Latitude	1448	18.675	82	18.647	126	19.024	0.028	-0.349***
		(0.039)		(0.185)		(0.149)		
Drought in 1545	1350	-3.634	70	-3.561	122	-3.487	-0.073	-0.146***
		(0.018)		(0.091)		(0.072)		
Drought in 1570	1252	-4.411	61	-4.497	106	-4.494	0.086	0.083
		(0.029)		(0.158)		(0.112)		
Log(Dist. to Mexico City)	1252	5.232	61	5.304	106	5.279	-0.071	-0.046
		(0.021)		(0.084)		(0.065)		
Log(Pop. Density in 1570)	1252	0.530	61	0.405	106	0.461	0.126	0.069
		(0.032)		(0.129)		(0.103)		
F-test of joint significance (F-stat)							0.582	0.558
F-test, number of observations							1313	1358

Notes: The value displayed for t-tests are the differences in the means across the groups, conditional on state fixed effects. Robust standard errors are presented in parentheses. See Data Appendix for more information on variables. *Festival: 0-30 Days Prior to Max CSI Planting* is an indicator variable equal to 1 if the saint day festival in a municipality occurs within 0-30 days prior to the optimal planting date of the maximum CSI crop for a municipality using FAO GAEZ data. *Festival: 0-30 Days After Maize Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs 0-30 days after the optimal maize harvest date of the maximum CSI crop for a municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.