Religious Festivals and Economic Development:
Evidence from the Timing of Mexican Saint Day Festivals

Eduardo Montero
University of Chicago

Dean Yang
University of Michigan

Religious Festivals and Economic Development

- Religious festivals are prominent in social life worldwide, and societies devote substantial resources to celebrating them (Banerjee and Duflo, 2011)

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  - Festivals may be *detrimental* if they crowd out investments

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  - Festivals may be *beneficial* if they lead to more social capital
  - Festivals may be *detrimental* if they crowd out investments

- Difficult to credibly estimate causal impacts of religious practices
  - Features of festivals (e.g., timing on calendar) could be chosen (or evolve) to enhance positive effects or minimize negative effects on development
  - Development itself could influence festival characteristics
  - Festivals are often common to entire societies

The Most Famous Mexican Religious Festival

Figure 1: *Dia de los Muertos* (November 1-2)

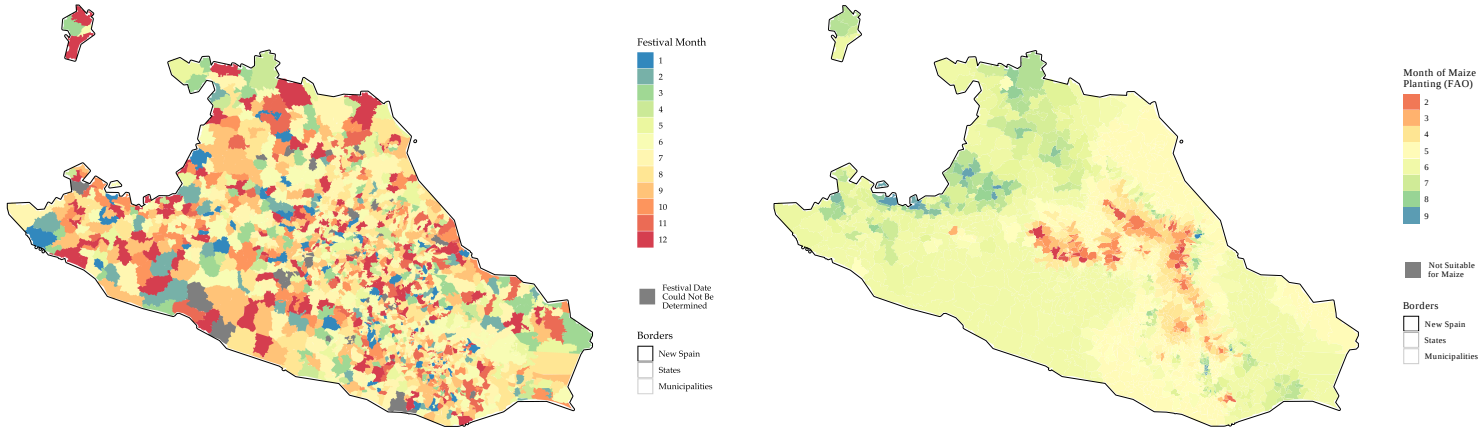
A Local Mexican Religious Festival

Figure 2: The Feast Day of *Santa Magdalena* (July 22) - Xico, Veracruz

This Paper

- Investigate the impact of a particular religious practice that Spanish conquerors introduced in Mexico: Catholic patron saint day festivals
- Take advantage of two features of the setting:

Figure 3: Timing of Festivals and Agricultural Seasons in New Spain



a. Saint Day Festival Month

b. Maize Planting Month

⇒ Compare municipalities with agriculturally-coinciding festivals – those that coincide with peak planting or harvest periods – to those without

Research Questions & Findings

$\Rightarrow$ How does festival timing affect development today?

- $\rightarrow$ Construct a dataset of Mexican municipalities' patron saints, and determine if their festival dates coincide with key planting and harvest periods
- $\rightarrow$ Agriculturally-coinciding festivals are associated with less development

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- → Coinciding festivals lead to lower agricultural productivity and less structural transformation in the long-run

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$\Rightarrow$ What are the impacts of festivals on religiosity and social capital?

- $\rightarrow$ Coinciding festivals are associated with more religiosity and social capital
- $\rightarrow$ May help explain why coinciding festivals continue to persist

Contributions & Literature

1. Anthropologists on Mexican saint day festivals
    - Harris (1964): festivals involved “enormous economic burdens” and “irrational uneconomic” behaviors
    - Greenberg (1981, pg. 153-158): festivals’ negative consequences depended on their timing vis-a-vis agricultural calendar

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2. Economic Consequences of Religious Practices

- Correlations between religious practices and economic outcomes (e.g. Barro and McCleary, 2003; McCleary and Barro, 2006, 2019)
- More recent work with strong focus on causal identification (e.g. Campante and Yanagizawa-Drott, 2015; Schofield, 2020; Bryan et al., 2021)
- We exploit plausible cross-sectional variation to examine effects on long-run development across localities

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3. Determinants of Religiosity and Social Capital

- Religious practice often linked to social capital (e.g. Putnam, 2000; Deaton and Stone, 2003; Lim and Putnam, 2010)
- We find that costlier religious practices (coinciding festivals) can lead to more religiosity and social capital

Outline

Catholic Patron Saint Day Festivals

- A longstanding Catholic religious practice: celebrate saints or holy figures on their annual “feast day” or “saint day”
- Localities in Catholic societies typically have a “patron saint”, whose saint day they celebrate
- During Spanish colonization of Mexico (and elsewhere), Catholic religious authorities used saint day festivals to bolster conversion efforts
  - Upon a town’s founding or conquest in colonial period, patron saint was chosen
- Dates spread over the calendar year, set by the Vatican
  - For example, today – December 1st – is the feast day of *San Eloy*

Importance of Saint Days in Mexico

- Saint day festivals were a critical part of efforts to convert local populations to Catholicism:
  - Became popular because they commingled Spanish and indigenous religious elements (Lastra et al., 2009; Beezley and Meyer, 2010)
  - Lasted $\geq$3 days: began with a mass the first night, followed by processions, sermons, music, dancing, markets, fireworks, bull runs, and a communal meal for the whole village (Tanck de Estrada, 2005)
- Saint day festivals became "one of the most important activities of the municipal governments"(Tanck de Estrada, 2005)
  - Villages spent 75% of their annual public sector revenue on religious festivals (Gibson, 1964)

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  - Villages spent 75% of their annual public sector revenue on religious festivals (Gibson, 1964)
- In the 1790s, colonial government imposed spending limits, calling the "excesses" of the festivals "superfluous and vicious" (Tanck de Estrada and Marichal, 2010)

Mayordomia System in Mexico

- Government spending limits led to the formalization and increased prominence of the distinctive *mayordomia* (or *cargo*) social system:
  - Rotating set of households assumed responsibility for organizing and financing the annual festival
- Becoming a *mayordomo* brought respect, but involved significant expenditures (Beezley and Meyer, 2010)
  - Expenses were "fixed by custom and agreement" (Gibson, 1964)
  - "Invariably high" expenditures often meant "that villagers were forced to sell parcels of land" (Brandes, 1981)

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  - "Invariably high" expenditures often meant "that villagers were forced to sell parcels of land" (Brandes, 1981)
- Estimates for modern *mayordomia* expenditures:
  - In Santiago Yaitepec: in 1973, each *mayordomo* spent ≈4,566 pesos ($2,211) for the patron saint festival (Greenberg, 1981)
  - In Santiago Nuyoó: in 1985 the *mayordomia* distributed 204,937 pesos worth of food ($46,425) (Monaghan, 1990)

Mayordomia System in Mexico

- In the 1960s-70s, anthropologists became interested in understanding the *mayordomia* system and its persistence:

  "The most striking element of these [mayodormia] systems is that generally poor peasants spend considerable time and money sponsoring fiestas to honor the saints, [in] what appears to be economically irrational behavior" (*Dewalt, 1979*)

- Spurred by arguments that the "imposed" festivals were "repressive and abusive" (Harris, 1964)

- Proposed two main explanations:
  1. Serving as a *mayordomo* was a costly signal of religiosity and wealth to the community (Monaghan, 1990; Chance and Taylor, 1985)
  2. Due to rotating nature, the *mayordomia* system served an important redistributive role within the community (Greenberg, 1981; Rosales Martínez et al., 2020)

Selection of Saints

- 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

- In Mexico, there were three main ways patron saints were chosen by Spanish colonizers for particular communities:
  1. Military conquest dates
  2. Similarities between saint and community characteristics
  3. Similarities between saint and indigenous god characteristics

- Some oral histories describe saints being chosen at random (!)
  - Saint names were physically pulled out of a bowl, so that saints could "choose" the locality (Ragon, 2002)

Selection of Saints - Conquest

- Initially, many patron saints were assigned by the Spanish following military victories that prompted the choice of the first patron saints (Ragon, 2002)

- Characteristics of the military actions undertaken during conquest also played a role in choosing their patron saints

Figure 4: *San Francisco* Festival in Actopan, Veracruz

Selection of Saints - Other Methods

- Alternatively, saints were sometimes chosen based on similarity to already worshiped indigenous gods (Nutini, 1976)
- Other times, town were assigned a saint based on salient characteristics of their community and particular functions of saints (Ragon, 2002)
    - However, selection based on functional or symbolic similarities rather than dates of indigenous festival celebrations (Nutini, 1968)

Outline

Conceptual Framework & Hypotheses

- We hypothesize that agriculturally-coinciding festivals – those that coincide with peak planting or harvest periods – hinder long-run economic development

- Planting and harvest times have unusually high – but time-sensitive – economic returns in agriculture. If households are time- and liquidity-constrained, coinciding festivals can crowd out both labor and investment in agriculture

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- Persistently lower agricultural productivity slows structural transformation:

Coinciding Festivals → ↓ Agricultural Productivity → ↓ Structural Transformation → ↓ **Economic Development**

Outline

Saint Days Across Mexico

- We assembled data on the saint celebrated by each municipality in Mexico
  - Mostly from the *Encyclopedia of Municipalities in Mexico* (78%)
  - Supplemented with (i) online searches (7%) and (ii) directly contacting municipalities (15%)
  - To avoid endogeneity concerns, we always use celebration dates prescribed by the Vatican (14% of municipalities depart from this “official” date)

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  - To avoid endogeneity concerns, we always use celebration dates prescribed by the Vatican (14% of municipalities depart from this "official" date)
- Primary analyses focus on *New Spain* region of Mexico
  - Region that was first conquered by the Spanish, and main administrative unit during early colonial history (Gerhard, 1993)
  - *Note:* We show results for all of Mexico as well for robustness

New Spain Region of Mexico

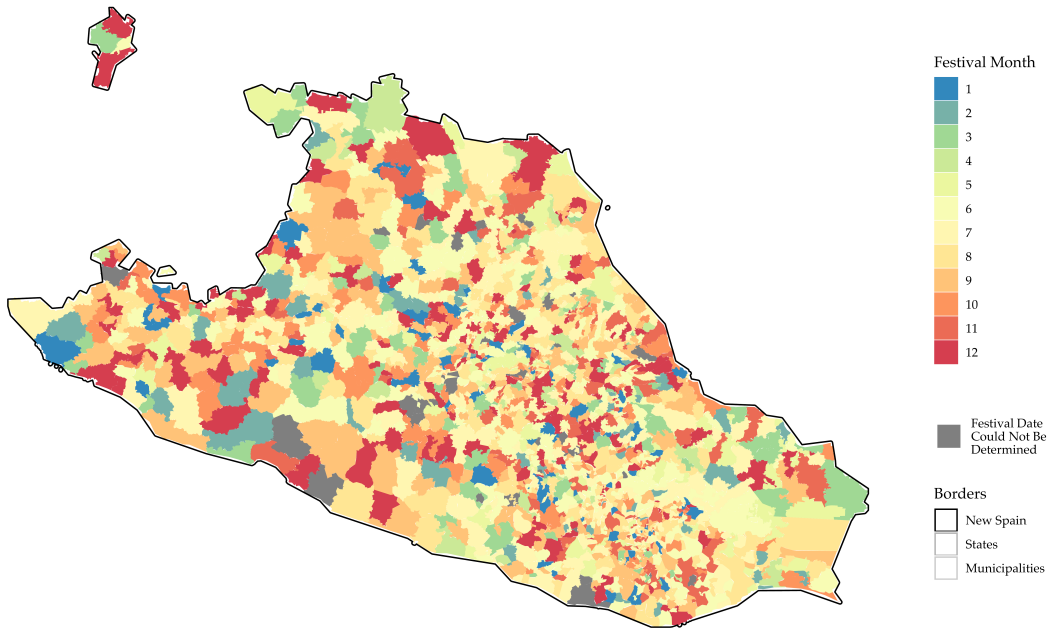
Figure 5: *New Spain* Region of Mexico

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 (1993) in black.

- *New Spain* Municipalities:
  - Temperate/subtropical climate distinct from rest of Mexico
  - Nearly all areas suitable for maize cultivation
  - Municipalities more compact, higher population density than rest of the country

Timing of Patron Saint Day Festivals Across *New Spain*

Figure 6: Map of Saint Days Across *New Spain*, Mexico



Notes: The map presents the month that each municipality in the New Spain region of Mexico celebrates its respective Catholic saint day festival. Municipalities where we were unable to determine the festival date are shaded in dark grey.

▸ Map: Festivals Across Mexico

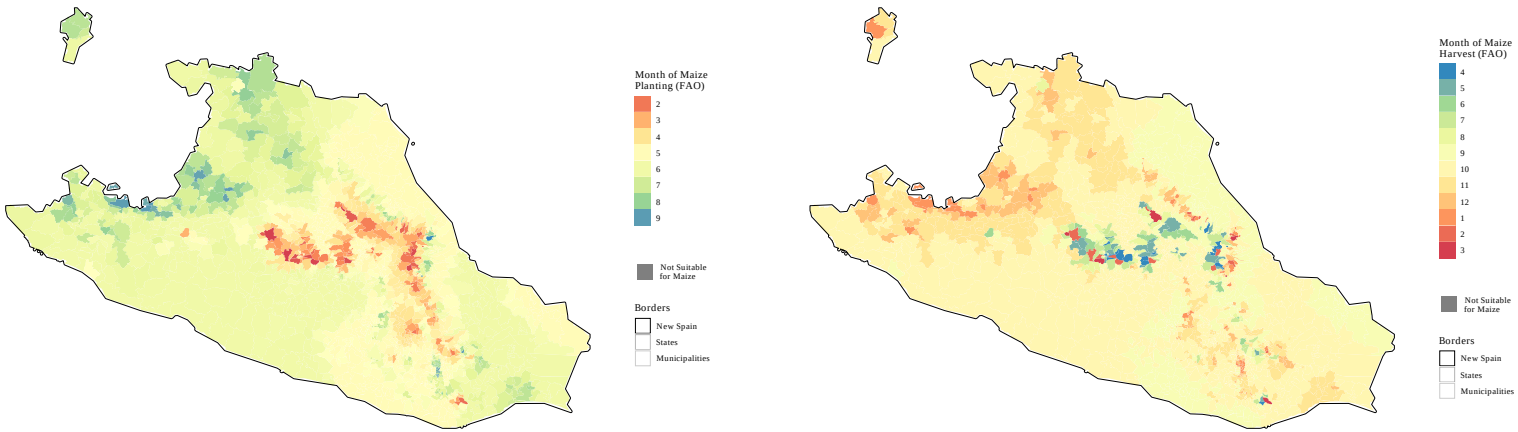
Data on Crop Planting and Harvest Dates

- Planting and harvest dates for crops are from the FAO's Global Agro-Ecological Zones (GAEZ) project:
  - Provides crop growth cycles, optimal planting dates, and yield estimates at a global grid-cell level, where each grid is 5' $\times$ 5', or $\approx$100 km^2
  - Helps avoid endogeneity concerns, as we rely on external measures for planting and harvest dates
- Focus on the planting and harvest cycle for *maize*
  - Maize is and has historically been the most important crop in the region

▸ Validating FAO Data for Mexico

Maize Planting and Harvest Dates Across *New Spain*

Figure 7: Map of Optimal Maize Planting and Harvest Month (FAO data)



a. Maize Planting Month

b. Maize Harvest Month

Notes: The map presents the optimal (a.) maize planting month, and (b.) maize harvest month according to FAO GAEZ 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 (1993) in black.

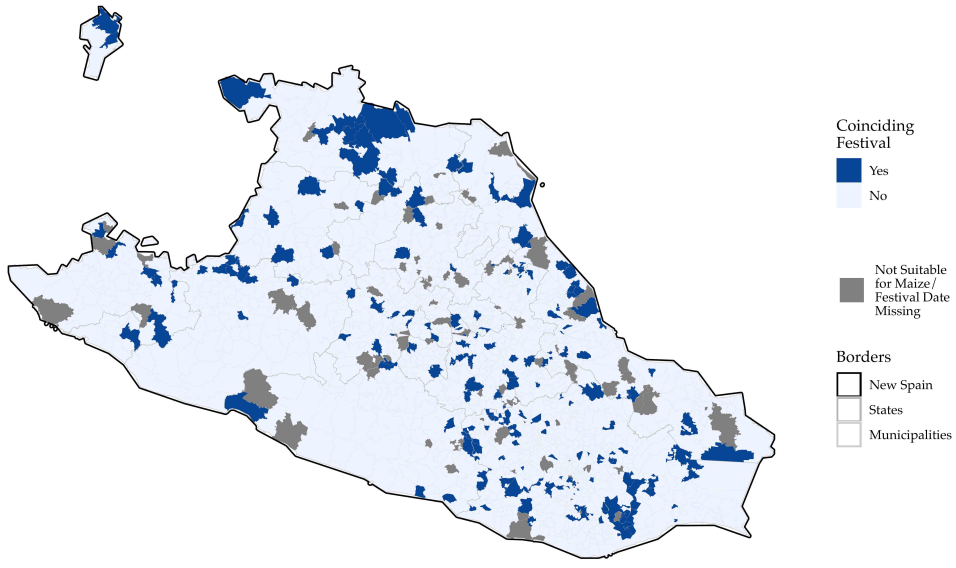
▸ Map: Planting Date Across Mexico

▸ Map: Harvest Date Across Mexico

Coincidence between Festivals and Planting Across *New Spain*

- Combine data to determine coincidence of festival months with planting and harvest months:

Figure 8: Agriculturally-Coinciding Festivals - *New Spain* Region of Mexico



Notes: Coinciding Festival is equal to "Yes" if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data, and "No" otherwise for each municipality in the New Spain region of Mexico. Municipalities where we were unable to determine the festival date or are unsuitable for maize are shaded in dark grey.

▸ Map: Coincidence Across Mexico ▸ Map: Overlap (Days) Across New Spain ▸ Map: Overlap (Days) Across Mexico

Estimating Equation:

To examine the impacts of agriculturally-coinciding festivals, we estimate:

$$y_m = \beta \textit{ Festival Coincides with Planting or Harvest}_m + \alpha_{s(m)} + \mathrm{X}_m' \mathrm{B} + \epsilon_m$$

- y_m is our outcome of interest for municipalities m
- *Festival Coincides with Planting or Harvest*$_m = 1$ if festival in m occurs either 0-30 days *before* planting or 0-30 days *after* harvest
- $\alpha_{s(m)}$ represent state fixed effects: account for all time-invariant differences across states
- X_m is a vector of geographic, climatic, and historical controls for municipality m (including festival-month, planting-month, and harvest-month fixed effects)

Identification Concerns

- Main Identifying Assumption:
  - Whether a municipality's saint day festival coincides with planting or harvest is independent of other features of the municipality that may also affect economic development
  - *Note:* this is a less restrictive assumption than assuming that festival dates are exogenous

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- In identifying coinciding festivals, use only external data
  - Vatican-prescribed festival dates
  - Optimal planting and harvest times from FAO GAEZ database

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- Review historical sources on choice of saints for municipalities
- In identifying coinciding festivals, use only external data
  - Vatican-prescribed festival dates
  - Optimal planting and harvest times from FAO GAEZ database
- Empirical tests:
  1. Examine whether municipalities "avoid" having coinciding festivals
  2. Test "baseline" balance with respect to coinciding festivals

Identification Concern I - Strategic Festival Choice

- Strategic choice of festivals would imply that it is less likely that festivals coincide with planting/harvest months compared to other periods
- We explore this by estimating:

$$\textit{Festival Date}_{mt} = \beta\, \textit{Planting or Harvest Month}_{mt} + \alpha_{s(m)} + \theta_{w(t)} + \phi_{ws} + \epsilon_{mt}$$

- *Festival Date*$_{mt}$=1 if the festival for a municipality m occurs on calendar date t
- *Planting or Harvest Month*$_{mt}$=1 if t is 0-30 days prior to planting or 0-30 after harvest in municipality m
- $\theta_{w(t)}$: calendar-week fixed effects, accounting for the overall average frequency of festivals across dates
- $\alpha_{s(m)}$: state fixed effects

▸ Results

Festival Dates and Agricultural Seasons

Table 1: Festival Dates and Maize Planting or Harvest Periods

	Dependent Variable: *Festival Date*			
	(1)	(2)	(3)	(4)
Maize Planting or Harvest Month	−0.020	−0.013		
	(0.017)	(0.018)		
	[0.017]	[0.018]		
Maize Planting Month			−0.020	−0.009
			(0.020)	(0.022)
			[0.021]	[0.022]
Maize Harvest Month			−0.021	−0.018
			(0.027)	(0.028)
			[0.028]	[0.028]
Calendar Week Fixed Effects	Y	N	Y	N
Week by State Fixed Effects	N	Y	N	Y
Observations	583,038	583,038	583,038	583,038
Clusters	1,593	1,593	1,593	1,593
Adjusted R2	0.004	0.004	0.004	0.004
Mean Dep. Var.	0.273	0.273	0.273	0.273

Notes: Observations are at the municipality-calendar date level for municipalities in the *New Spain* region of Mexico for which we have festival data. Standard errors clustered at the municipality level are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. *Festival Date* is an indicator variable equal to 1 if the festival for a municipality occurs on that date. For ease of interpretation, we multiply all regression coefficients by 100. *Maize Planting or Harvest Month* is an indicator variable equal to 1 if a date falls within 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. *Maize Planting Month* is an indicator variable equal to 1 if a date falls within 0 to 30 days prior to the optimal maize planting date for a municipality using FAO GAEZ data. *Maize Harvest Month* is an indicator variable equal to 1 if a date falls within 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

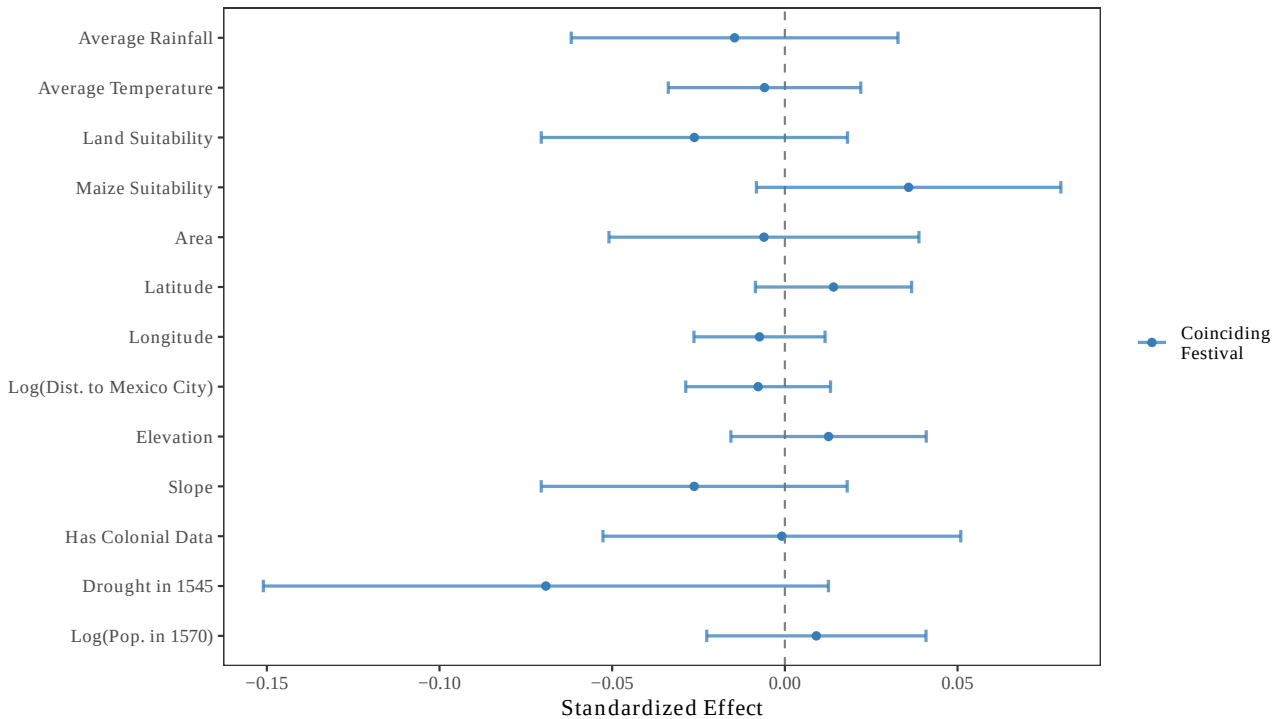
⇒ No evidence that festivals are more or less likely to coincide with planting or harvest dates ▸ Equation

Identification Concern II - Balance

- Second concern: municipalities that have an agriculturally-coinciding festival differ systematically on other dimensions that may affect present day development
- To examine this, we estimate our main estimating equation but have outcome y_m represents a series of important geographic, climatic, and historical characteristics that might also affect long-run development

Coinciding Festivals and Municipality Characteristics

Figure 9: Municipality Characteristics and Coinciding Festivals



Notes: Data are from the 2010 Mexico Population Census for *New Spain* region of Mexico. Colonial drought and population density data are from Sellers and Alix-Garcia (2018). The figure presents the estimated standardized coefficients on indicator for coinciding festivals (and respective 95% confidence intervals) in regression with various municipality characteristics (denoted on the y-axis) as dependent variables, conditional on state fixed effects, planting-month and harvest-month fixed effects, and festival month fixed effects. *Coinciding Festival* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either within 0-30 days prior to the optimal maize planting date or 0-30 days after the optimal maize harvest date for a municipality using FAO GAEZ data, and 0 otherwise. Note that we do not have colonial characteristics for all observations in our sample; therefore, we also show results for *Has Colonial Characteristics*, an indicator equal to 1 if a municipality is not missing colonial characteristics.

⇒ No large or statistically significant relationship between coinciding festivals and these municipality characteristics

Outline

Census Data and Indexes

- We use data from the 2010 Mexico Population Census to examine differences in long-run development
- We focus on two main outcomes:

1. Household income
2. “Index of Economic Development”
    - Constructed using a broad range of questions in the census related to economic development within a municipality
    - Measures include: literacy, unemployment, years of schooling, asset ownership, etc.
    - Index is the first principal component of these measures

Differences in Development: Household Income

Table 2: Development Outcomes and Coinciding Festivals

	Dependent Variable:				
	Panel A: *Log HH Income*				
	(1)	(2)	(3)	(4)	(5)
Festival Coincides with Maize Planting or Harvest	−0.275	−0.204	−0.251	−0.255	−0.206
	(0.099)	(0.080)	(0.071)	(0.070)	(0.077)
	[0.107]	[0.080]	[0.082]	[0.079]	[0.075]
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
Festival-Week Fixed Effects	N	N	N	N	Y
Observations	1,593	1,593	1,593	1,593	1,593
Adjusted R2	0.004	0.347	0.538	0.543	0.567
Mean Dep. Var.	3.234	3.234	3.234	3.234	3.234
SD Dep. Var.	1.330	1.330	1.330	1.330	1.330

Notes: Data is from the 2010 Mexico Population Census. Observations are municipalities in the *New Spain* region of Mexico. Robust standard errors are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. *Festival Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude, mean elevation, mean slope, log distance to Mexico City, and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545 and log population density in 1570 using data from Sellers and Alix-Garcia (2018). For these colonial controls, values for municipalities with missing information are set to zero, and we control for an indicator variable equal to 1 if the municipality is not missing these colonial characteristics. *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. * $p < \mathbf{0.10}$, ** $p < \mathbf{0.05}$, *** $p < \mathbf{0.01}$.

$\Rightarrow$ Coinciding festivals lead to lower log household income

Differences in Development: Index

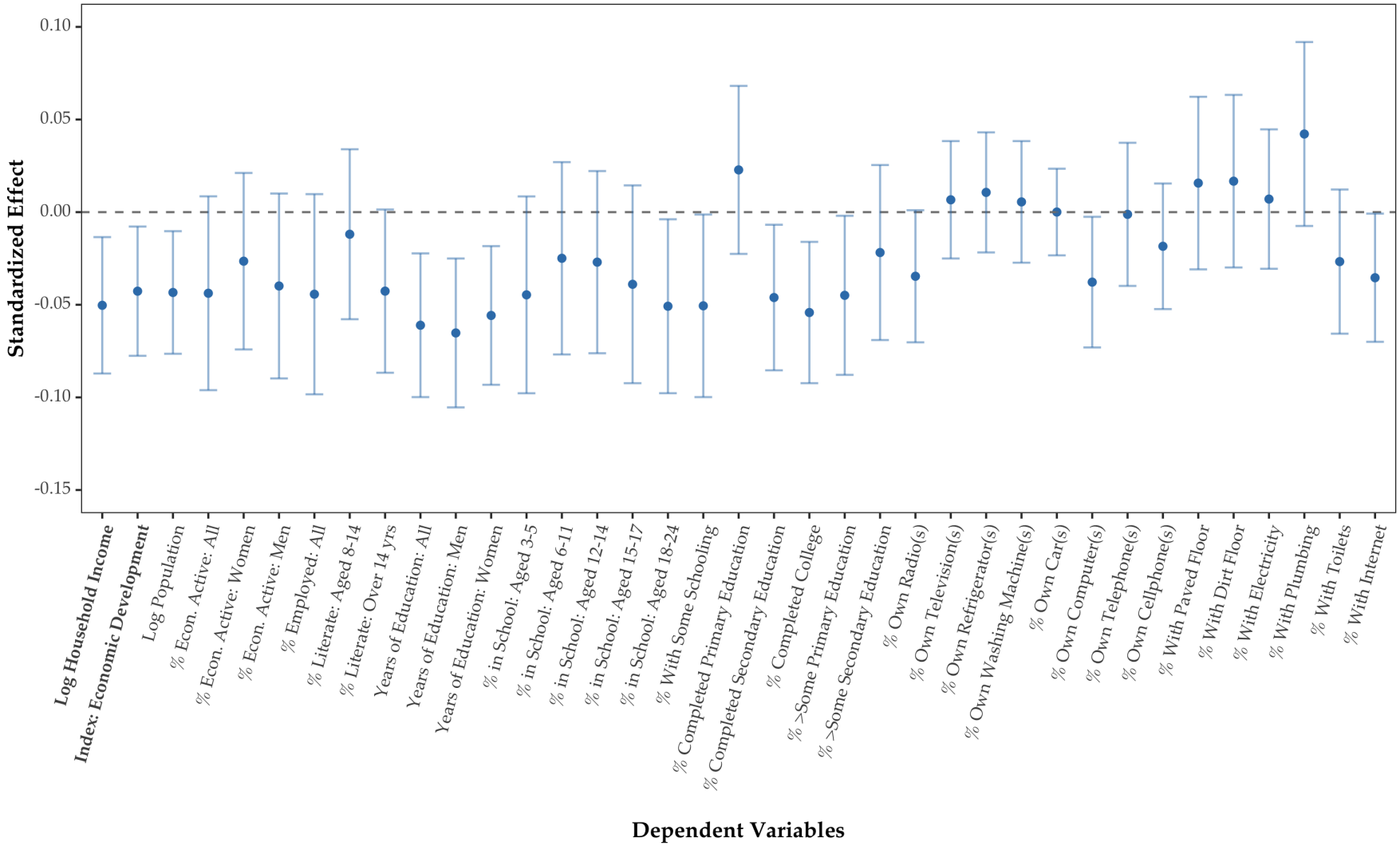
Table 3: Development Outcomes and Coinciding Festivals

	Dependent Variable:				
	Panel A: *Index of Economic Development*				
	(1)	(2)	(3)	(4)	(5)
Festival Coincides with Maize Planting or Harvest	−0.695	−0.422	−0.593	−0.613	−0.537
	(0.300)	(0.240)	(0.209)	(0.208)	(0.224)
	[0.342]	[0.252]	[0.226]	[0.220]	[0.190]
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
Festival-Week Fixed Effects	N	N	N	N	Y
Observations	1,593	1,593	1,593	1,593	1,593
Adjusted R2	0.002	0.348	0.566	0.572	0.597
Mean Dep. Var.	-0.589	-0.589	-0.589	-0.589	-0.589
SD Dep. Var.	4.039	4.039	4.039	4.039	4.039

Notes: Data is from the 2010 Mexico Population Census. Observations are municipalities in the *New Spain* region of Mexico. Robust standard errors are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. *Index of Economic Development* is the first principal component index for a number of development outcomes in the census for a municipality. *Festival Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude, mean elevation, mean slope, log distance to Mexico City, and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545 and log population density in 1570 using data from Sellers and Alix-Garcia (2018). For these colonial controls, values for municipalities with missing information are set to zero, and we control for an indicator variable equal to 1 if the municipality is not missing these colonial characteristics. *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. * $p < \mathbf{0.10}$, ** $p < \mathbf{0.05}$, *** $p < \mathbf{0.01}$.

$\Rightarrow$ Coinciding festivals lead to lower overall economic development

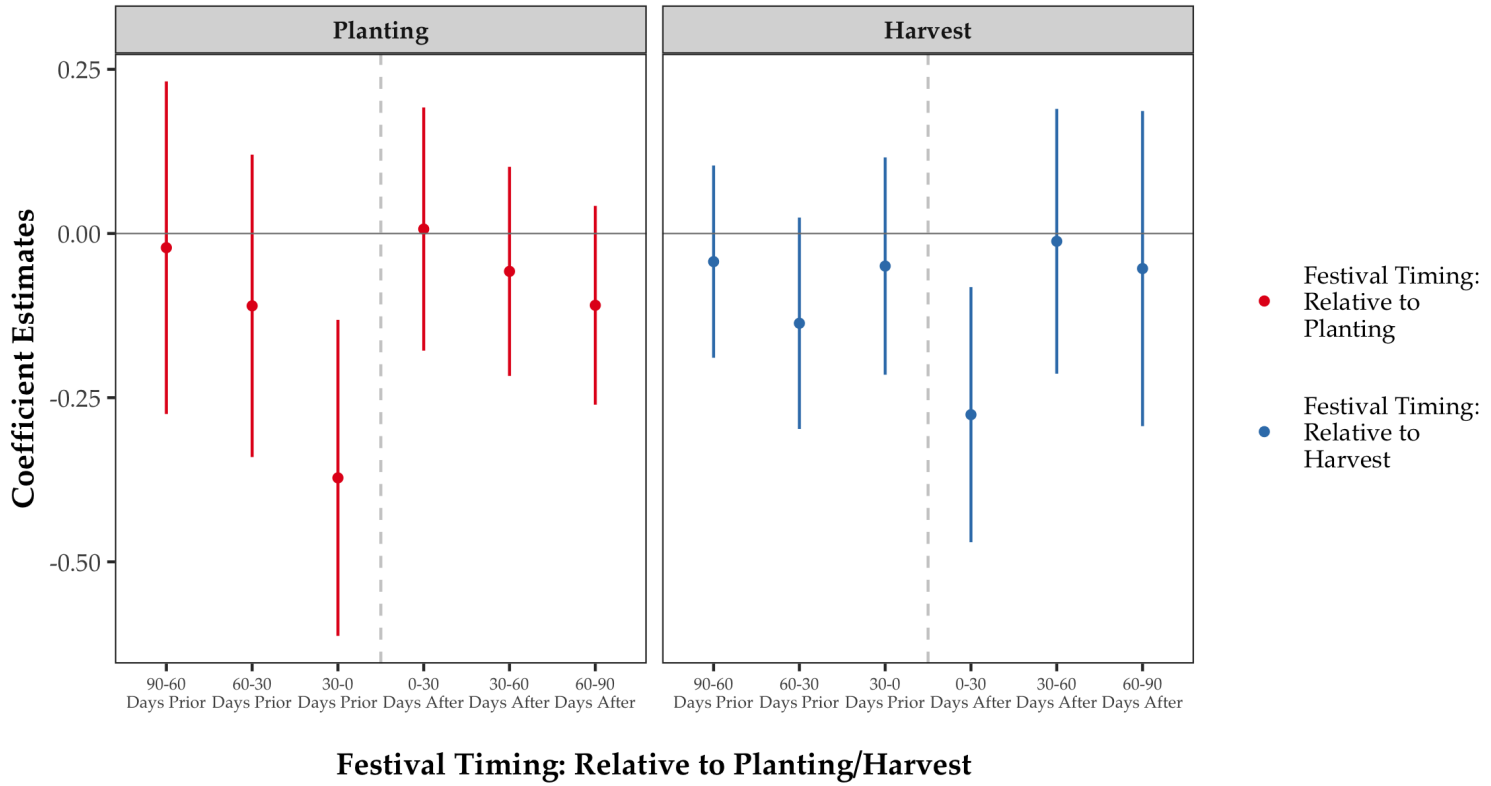
Differences in Development: Index Components



Notes: Data is from the 2010 Mexico Population Census. The figure presents the estimated coefficients and respective 95% confidence intervals on the sub-components of the *Index of Economic Development*. The regressions control for the full set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, *Festival Week Fixed Effects*, and *Planting & Harvest Month Fixed Effects*.

Impacts of Festival Coincidence with Other Periods

Figure 10: Impacts of Festivals Coinciding with Other Periods



Notes: Data are from the 2010 Mexico Population Census for the *New Spain* region of Mexico. The figure presents the estimated coefficients and respective 95% confidence intervals from estimating equation. The outcome variable is *Log Household Income*. *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*.

⇒ Largest estimated effects occur when the festival coincides with the planting or harvest period, and smaller impacts for other periods

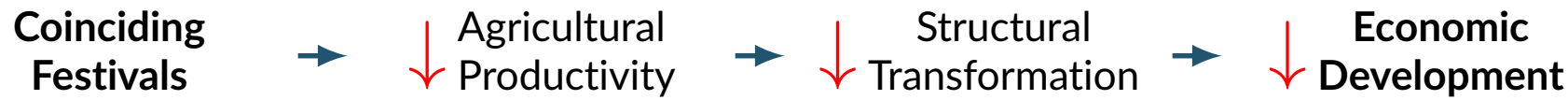
Extensions & Robustness Checks

- We conduct several extensions and robustness tests:
  - → **All of Mexico:** Expand the sample to all of Mexico ▸ All of Mexico
  - → **Aggregate Impact in New Spain:** Examine estimates would imply about aggregate GDP in the region if all municipalities with coinciding festivals instead had non-coinciding festivals ▸ Aggregate Impact
  - → **Placebo Festivals:** Conduct a randomization inference exercise assigning placebo festival dates ▸ Randomization Inference

Outline

Mechanisms

- The results so far establish that agriculturally-coinciding festivals lead to worse economic development outcomes in the long run
- Hypothesized that impacts emerge because festivals persistently hamper ability to take advantage of high-return but time-sensitive agricultural opportunities
- Mechanism for long-run development differences:



Mechanisms

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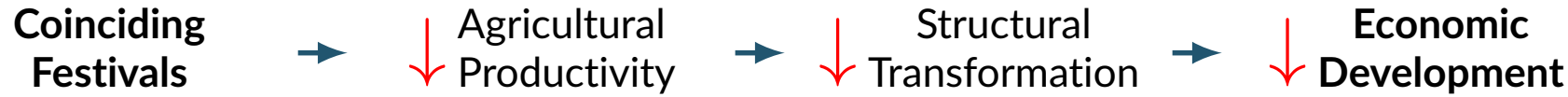


- To explore the mechanisms for this hypothesis, we conduct a number of empirical tests using:
  - IPUMS microdata for the Population Census
  - Maize yield and production data from the *Servicio de Información Agroalimentaria y Pesquera* (SIAP)

Agricultural Productivity and Structural Transformation

Table 4: Impact on Agricultural Productivity and Structural Transformation

	Dependent Variables:			
	Maize Yield	*% in Agriculture*	*% in Manufacturing*	*% in Services*
	(1)	(2)	(3)	(4)
Festival Coincides with Maize Planting or Harvest	−0.409	0.028	−0.004	−0.023
	(0.219)	(0.015)	(0.008)	(0.013)
	[0.197]	[0.014]	[0.008]	[0.012]
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
Festival-Week Fixed Effects	Y	Y	Y	Y
Observations	1,580	1,593	1,593	1,593
Adjusted R2	0.470	0.486	0.233	0.436
Mean Dep. Var.	6.128	0.414	0.114	0.465
SD Dep. Var.	4.140	0.237	0.095	0.198

Notes: Maize yield data are from the *Servicio de Información Agroalimentaria y Pesquera* (SIAP) for 2010, and other outcomes from the 2010 Population Census. Observations are municipalities in the *New Spain* region of Mexico. Robust standard errors are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. *Maize Yield* is the mean maize revenue yield in thousand of pesos per hectare for a municipality in 2010. *% 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. *Festival Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

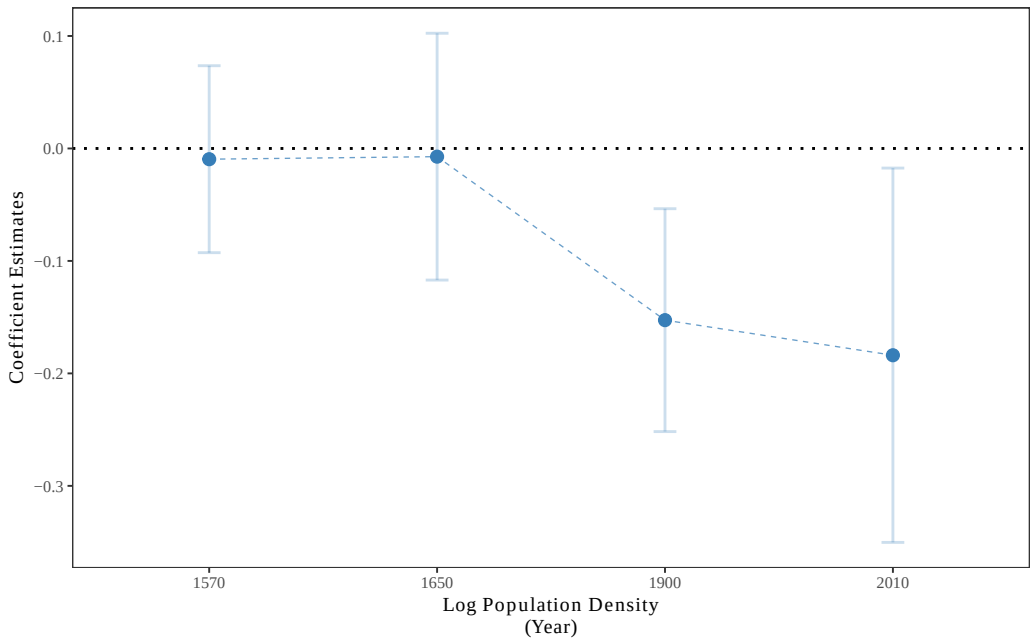
⇒ Coinciding festivals are associated with lower maize yields

⇒ Coinciding festivals are associated with a higher % of workers in agriculture and a lower % of workers in services, suggesting less structural transformation

Development Across Time

- Explore when these differences in development emerged using measures of population density from Sellers and Alix-Garcia (2018)

Figure 11: Population Density and Coinciding Festivals



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 regressions control for the full-set of controls: *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, and *Planting & Harvest Month Fixed Effects*.

⇒ Impacts of coinciding festivals emerged sometime after 1650, were already perceptible by the end of the 19th century, and have remained stable since

Outline

Impacts on Religiosity, Social Capital, and Inequality

- How do coinciding festivals affect religiosity and social capital?
  - Club goods models of religion, costly signals of religious devotion can raise religious participation (Iannaccone, 1992; Levy and Razin, 2014)
  - Agriculturally-coinciding festivals have uniquely high economic costs, making them particularly effective signals of religious commitment
- Use AmericasBarometer Data (2008-2018) and all the questions related to religion to create an index of religiosity:
  - The importance of religion in an individual's life
  - Frequency of church attendance
  - Membership in religious groups
- Use questions on participation in local groups to create an index of group membership to proxy for social capital

Coinciding Festivals, Religiosity, Social Capital, and Equity

Table 5: Religiosity, Social Capital, and Inequality

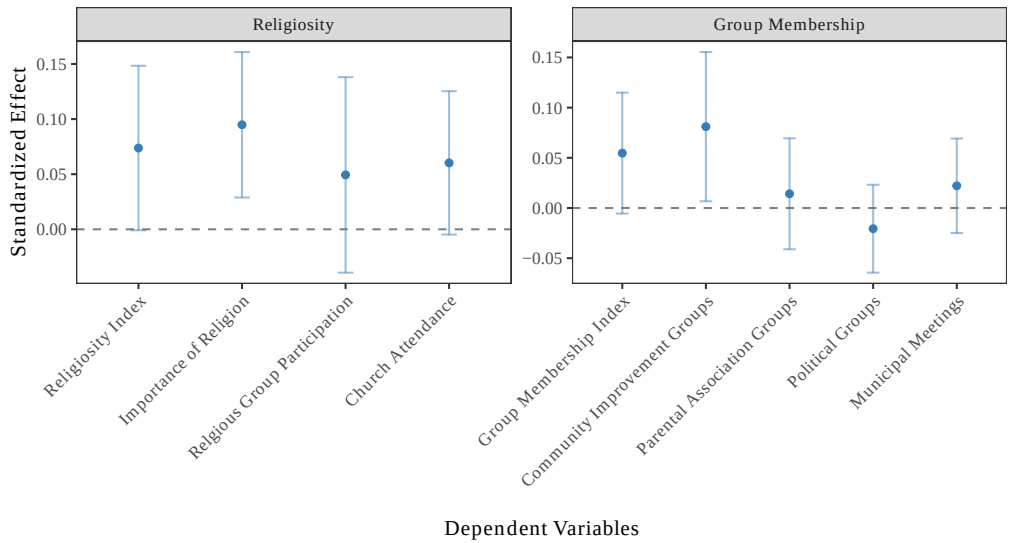
	Dependent Variables:		
	Religiosity Index	*Group Membership Index*	*IQR of Earned Incomes*
	(1)	(2)	(3)
Festival Coincides with Maize Planting or Harvest	0.315	0.240	−0.289
	(0.162)	(0.135)	(0.103)
	[0.155]	[0.125]	[0.111]
State Fixed Effects	Y	Y	Y
Geography Controls	Y	Y	Y
Colonial Controls	Y	Y	Y
Planting-Month Fixed Effects	Y	Y	Y
Harvest-Month Fixed Effects	Y	Y	Y
Festival-Week Fixed Effects	Y	Y	Y
Observations	4,796	4,818	1,593
Clusters	131	131	1593
Adjusted R2	0.129	0.050	0.555
Mean Dep. Var.	-0.187	0.063	2.168
SD Dep. Var.	1.266	1.306	1.833

Notes: Data are from the Americas Barometer (LAPOP) data (religiosity and social capital) and from the 2010 Mexico Population Censuses from IPUMS (inequality). Observations are individuals in municipalities in the *New Spain* region of Mexico. Standard errors clustered at the municipality level are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. *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 respondent, 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". *Group Membership Index* is the first principal component for the frequency with which a respondent participates in the following group meetings: community improvement, parental associations, municipal meetings, or political associations. *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 Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Coinciding festivals are associated with higher religiosity, higher social capital, and lower inequality

Religiosity and Social Capital Index Components

Figure 12: Impact of Coinciding Festivals on Religiosity and Social Capital: Estimates for *Religiosity Index* and *Group Membership Index* Components



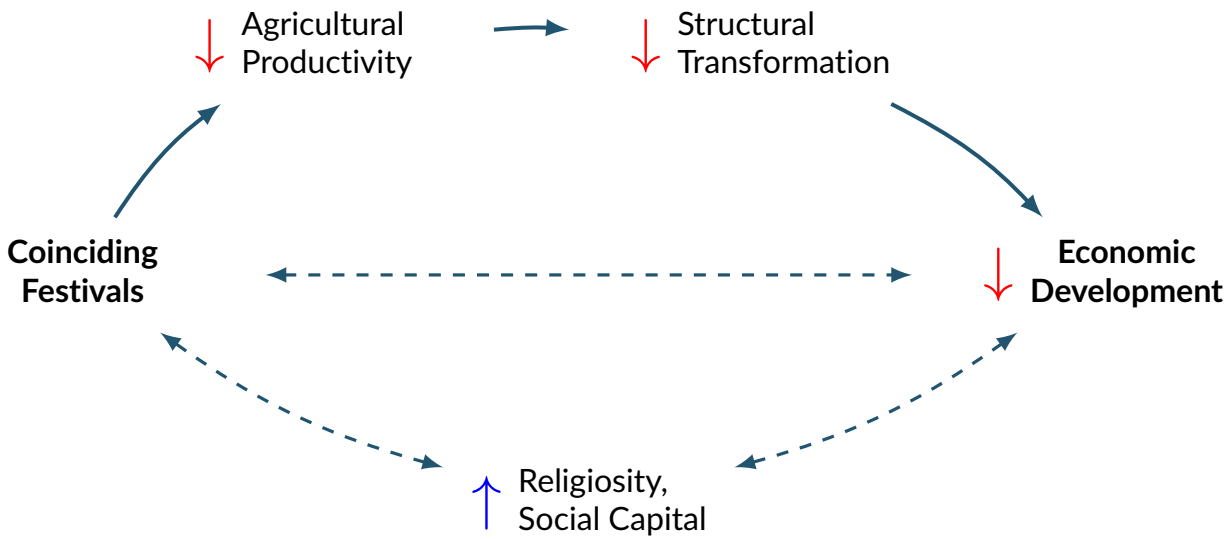
Notes: Data are from the Americas Barometer (LAPOP) data for *New Spain* region of Mexico. The figure presents the estimated coefficients and respective 95% confidence intervals from regressions on the sub-components of the *Religiosity Index* and the *Group Membership Index*. The dependent variables are denoted on the x-axis. We first show the estimates for each index, followed by estimates for each of the individual sub-components of the index. (See Data Appendix for more information.) The independent variable is *Festival Coincides with Maize Planting or Harvest*: an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. The regressions control for respondent age, age squared, gender, and for the following set of controls: *Survey-Wave Fixed Effects*, *State Fixed Effects*, *Geography Controls*, *Colonial Controls*, *Festival-Week Fixed Effects*, and *Planting- & Harvest-Month Fixed Effects*.

⇒ Impacts of coinciding festivals across index components are broadly positive (except for political participation)

▸ More: Migration

Mechanisms: Summary & Discussion on Persistence

- Suggestive evidence that the long-run negative impacts occur due to negative impacts on the agricultural sector:



- Effect on religiosity may help explain why agriculturally-coinciding festivals continue to persist

Outline

In sum

- We examine how religious festivals affect development by examining Catholic patron saint day festivals in Mexico
  - Create a dataset of festival dates across Mexico
  - Use variation in the timing of (i) festivals and (ii) agricultural seasons
- We find that festivals that coincide with planting or harvest periods:
  - $\Rightarrow$ Lead to significantly worse development outcomes in the long run
  - $\Rightarrow$ Reduce agricultural productivity and structural transformation
  - $\Rightarrow$ Lead to higher religiosity, social capital, and income equality
- Rare evidence of long-run economic and social impacts of variation in a prominent type of religious practice
- Directions for future research:
  - Use microdata to examine what investments festivals crowd out
  - Shed light on *extensive margin* impacts of festivals on development

Policy Implications

- What if a community seeks to reduce negative economic impacts of coinciding festivals?
  - $\Rightarrow$ Set deadlines for key investments (e.g., school fee payments) to avoid conflicts with festival periods, or allow payment flexibility
  - $\Rightarrow$ Facilitate early commitment of investment funds in non-coinciding periods (e.g., Duflo et al., 2011 nudges for fertilizer)
  - $\Rightarrow$ Place limits on festival expenditures or time commitments
  - $\Rightarrow$ Provide liquidity during festival times (e.g., “thirteenth salary”, “Christmas clubs”)
  - $\Rightarrow$ (Highly implausible:) Move festival dates to non-coinciding times

Thank you

- Thank you!
- We appreciate any comments: `emontero@uchicago.edu` and `deanyang@umich.edu`

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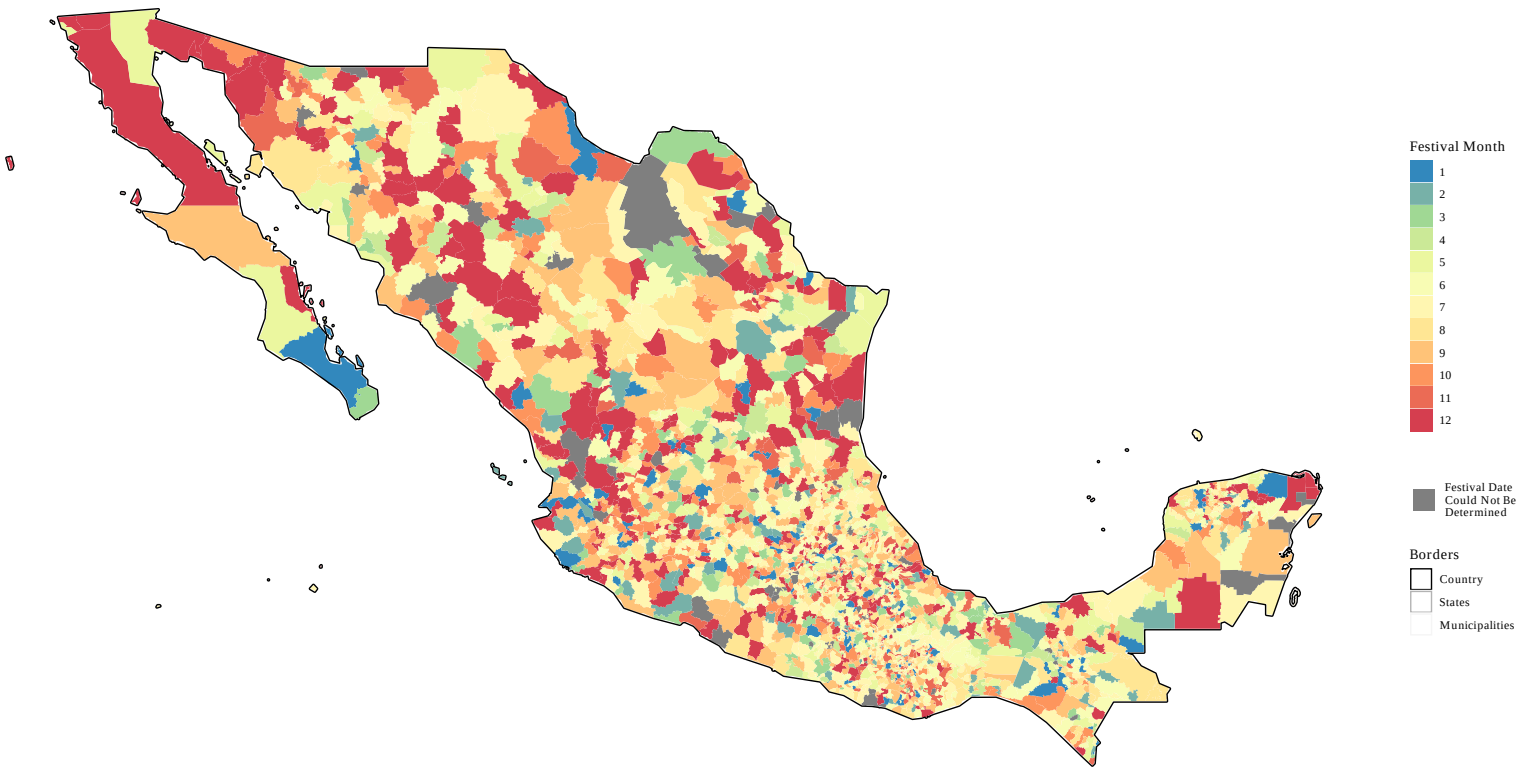
Patron Saint Day Festivals Across Mexico

Figure 13: Map of Saint Days - Mexico

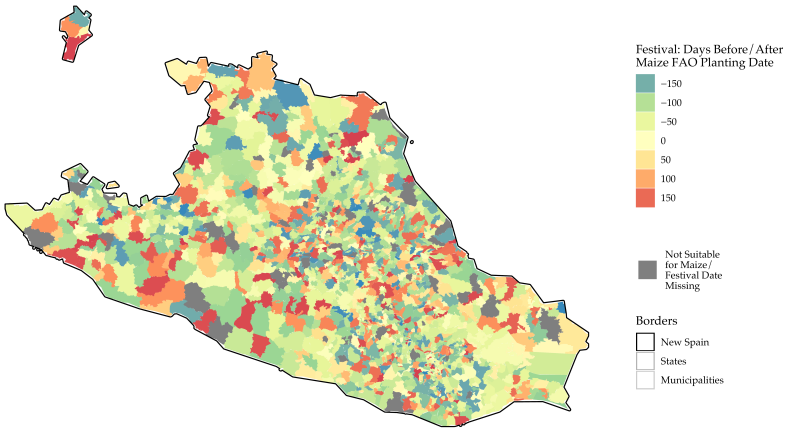


Return

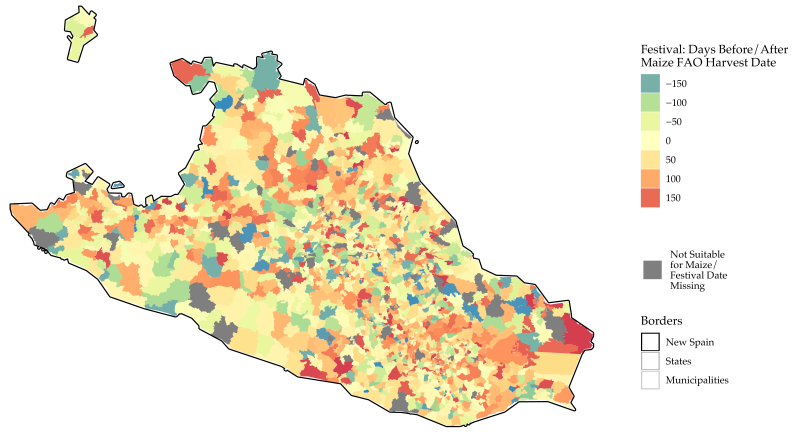
Coincidence between Festivals and Planting Across *New Spain*

- Combine data to determine coincidence of festival months with planting and harvest months:

Figure 14: Map of Days Between Festival and Optimal Planting/Harvest Dates



a. Maize Planting-Festival Overlap



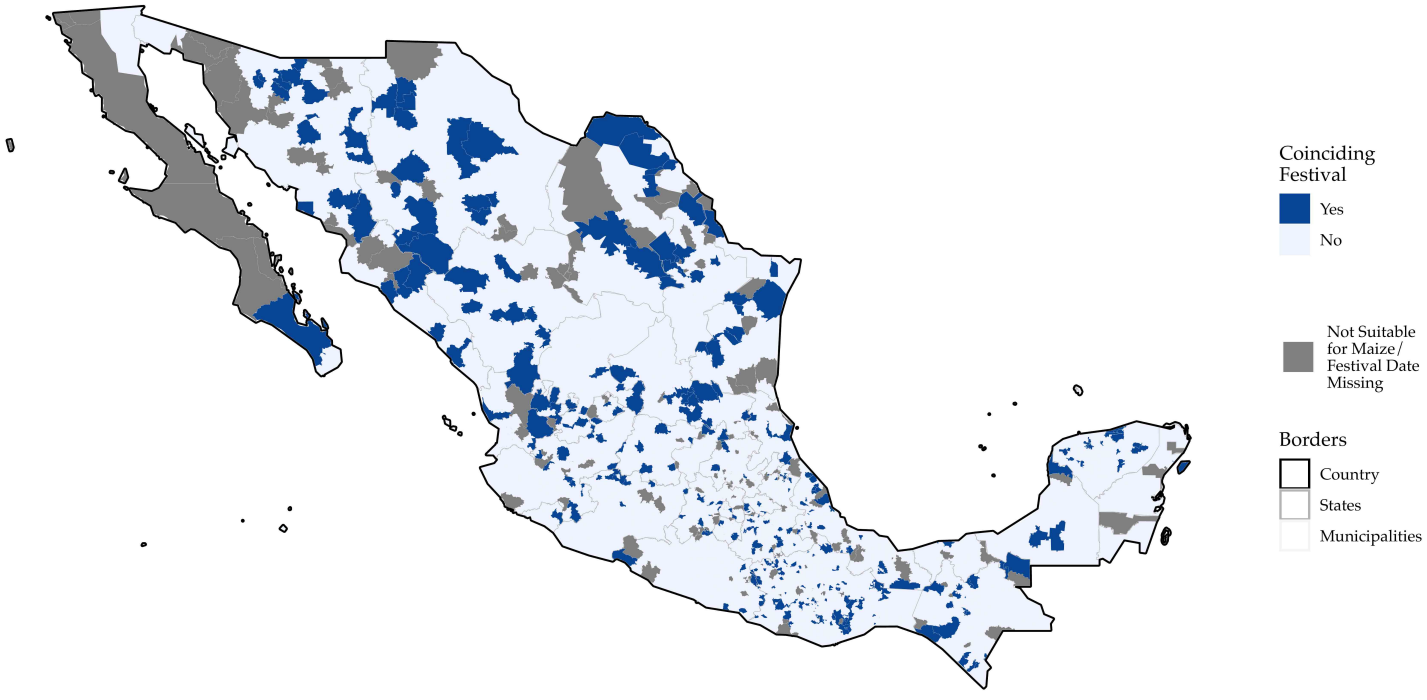
b. Maize Harvest-Festival Overlap

Notes: The map presents the difference (in days) between the Catholic saint day festival and the optimal maize planting date (a.) and harvest date (b.) (from FAO GAEZ data) for each municipality in the New Spain region of Mexico. (Negative values correspond to festivals that occur before planting/harvest; positive values correspond to festivals that occur after planting/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 (1993) in black.

▸ Map: Coincidence Across New Spain ▸ Map: Planting Overlap Across Mexico ▸ Map: Harvest Overlap Across Mexico

Coincidence between Festivals and Planting Across Mexico

Figure 15: Agriculturally-Coinciding Festivals



Notes: Coinciding Festival is equal to "Yes" if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data and "No" otherwise for each municipality in Mexico. Municipalities where we were unable to determine the festival date or are unsuitable for maize are shaded in dark grey.

▸ Map: Coincidence Across New Spain ▸ Map: Planting Overlap Across Mexico ▸ Map: Harvest Overlap Across Mexico

Overlap between Festivals and Planting Across Mexico

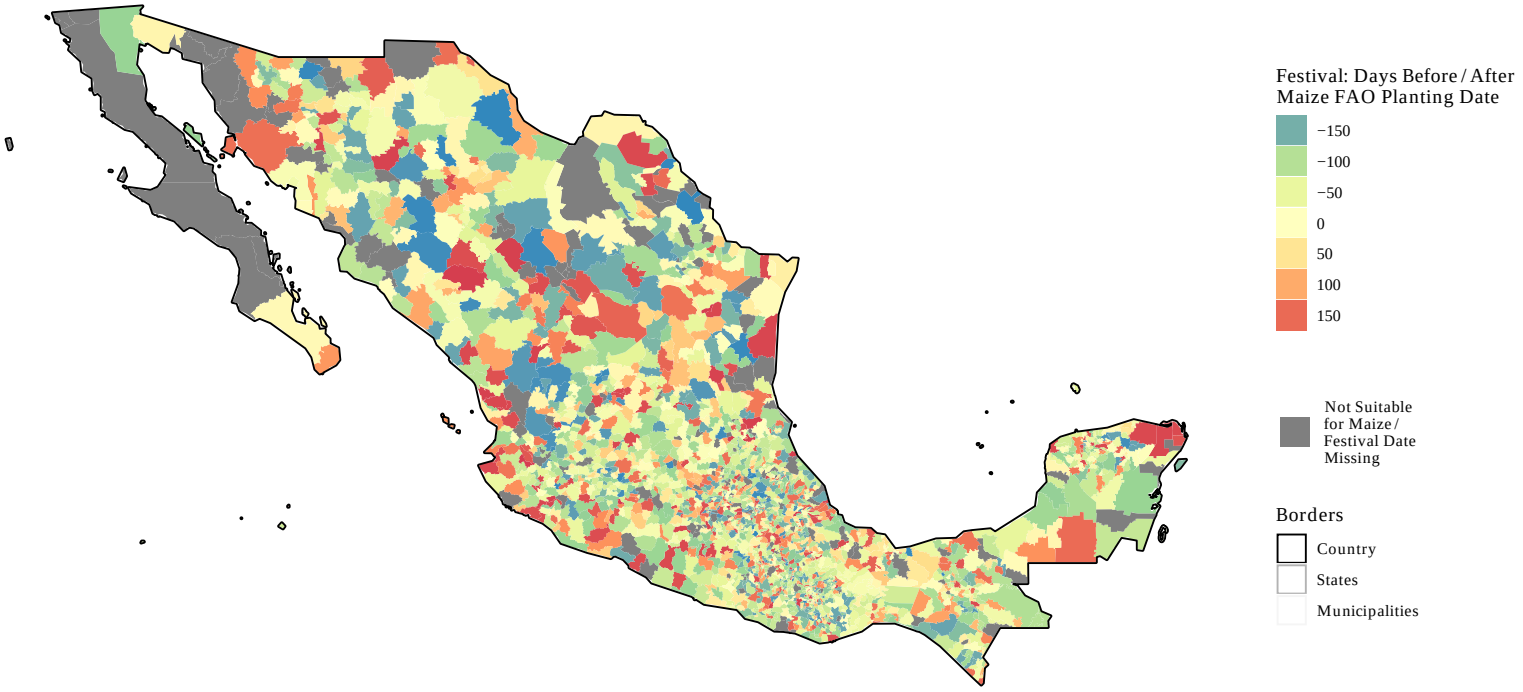
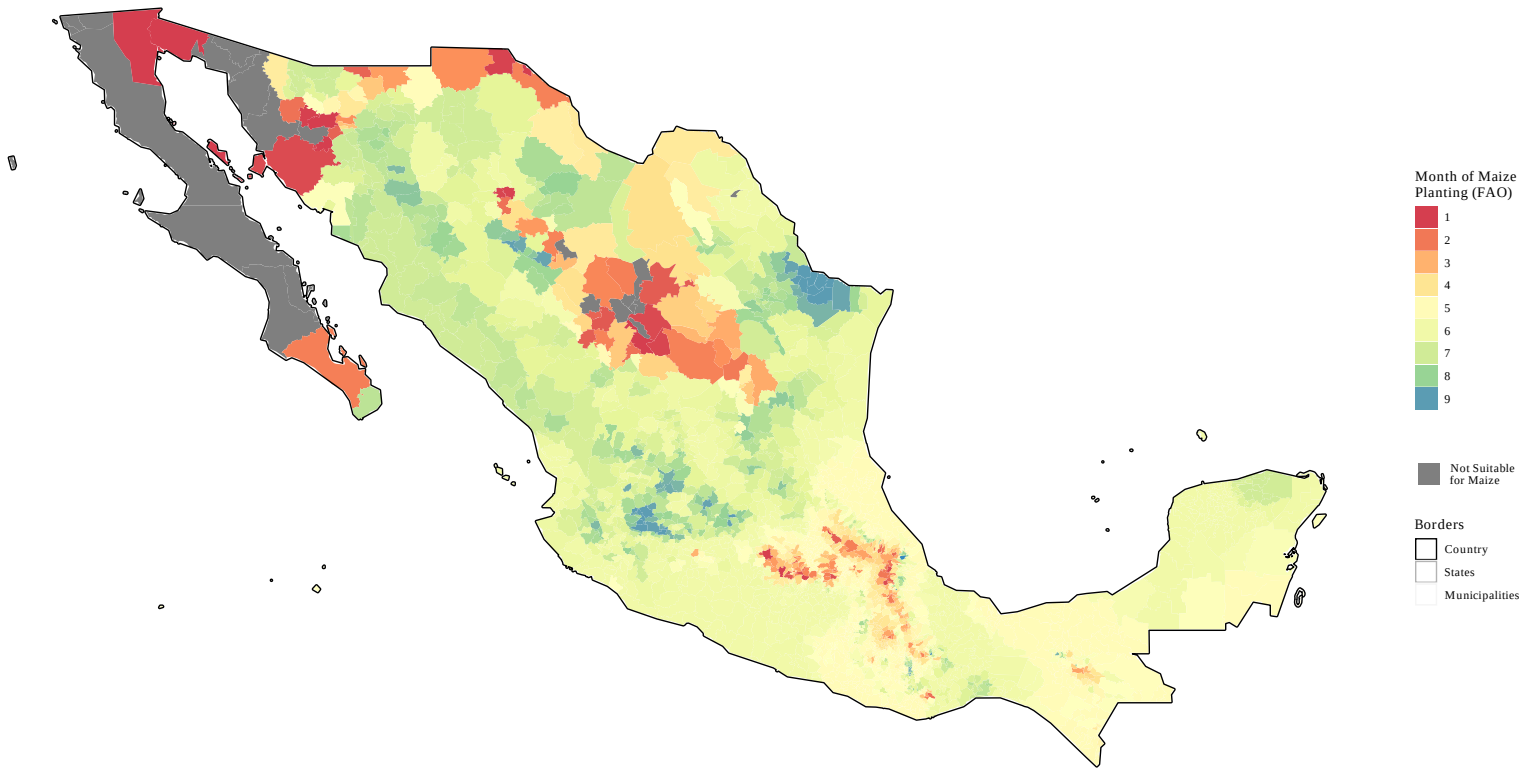


Figure 16: Map of Overlap Between Festival and Optimal Planting Date

▸ Map: Overlap in New Spain

Maize Planting Dates Across Mexico

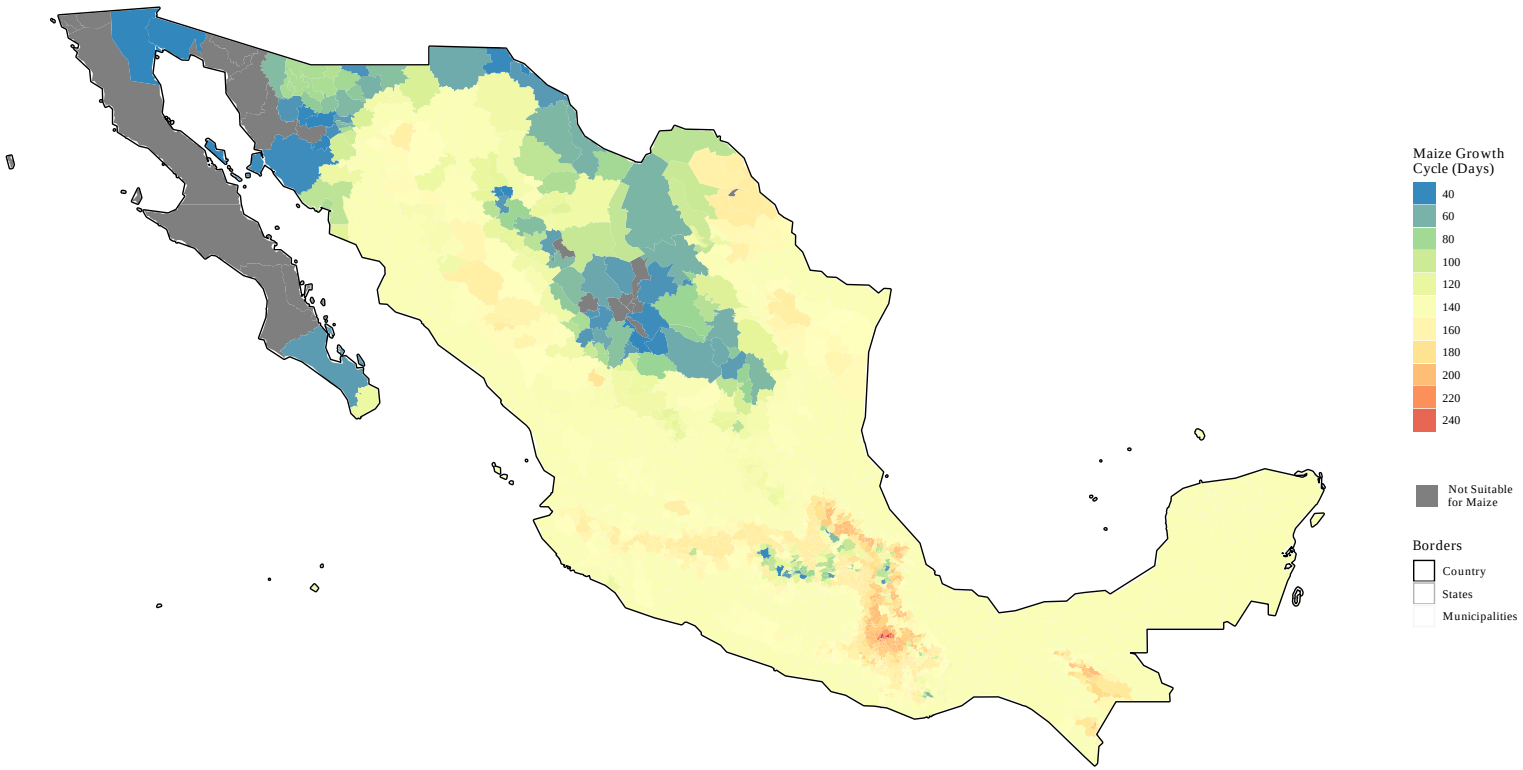
Figure 17: Map of Optimal Maize Planting Date (FAO data)



Return

Maize Harvest Dates Across Mexico

Figure 18: Map of Maize Growth Cycle Days (FAO data)



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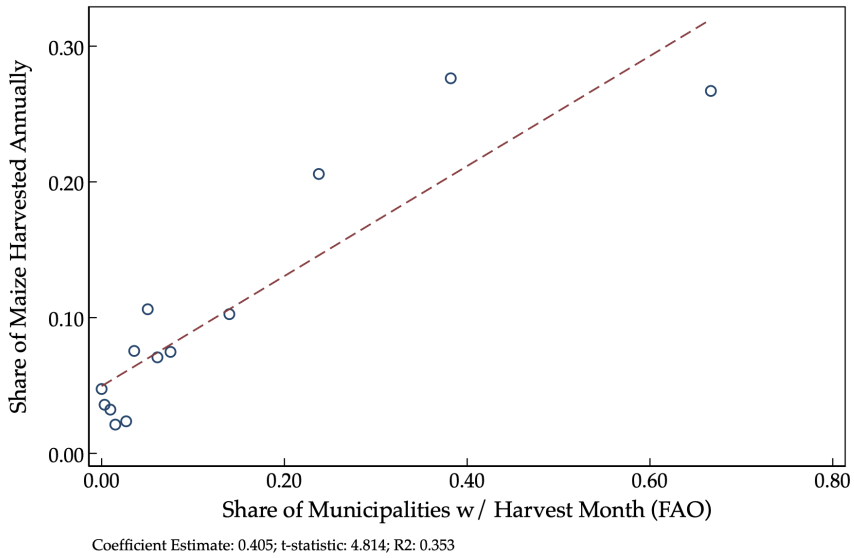
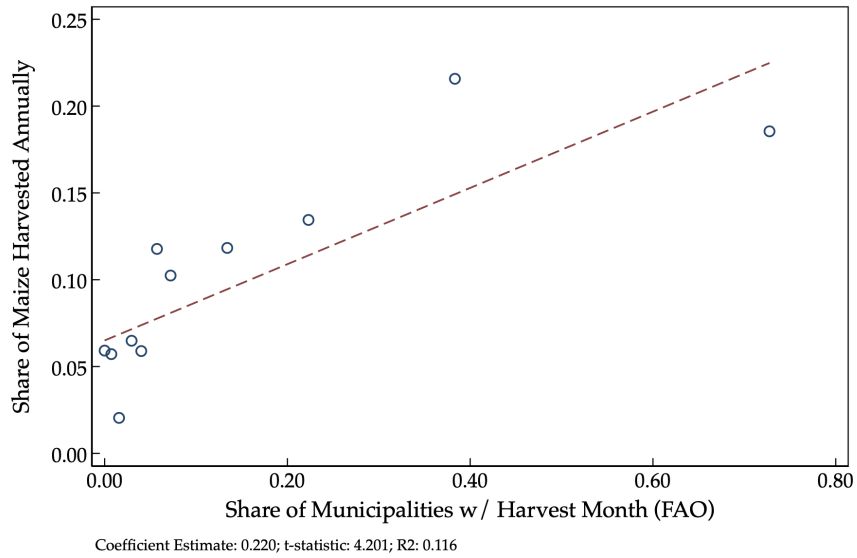
Validating FAO Maize Crop Calendar Data

Figure 19: 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.

▸ Return: FAO Data

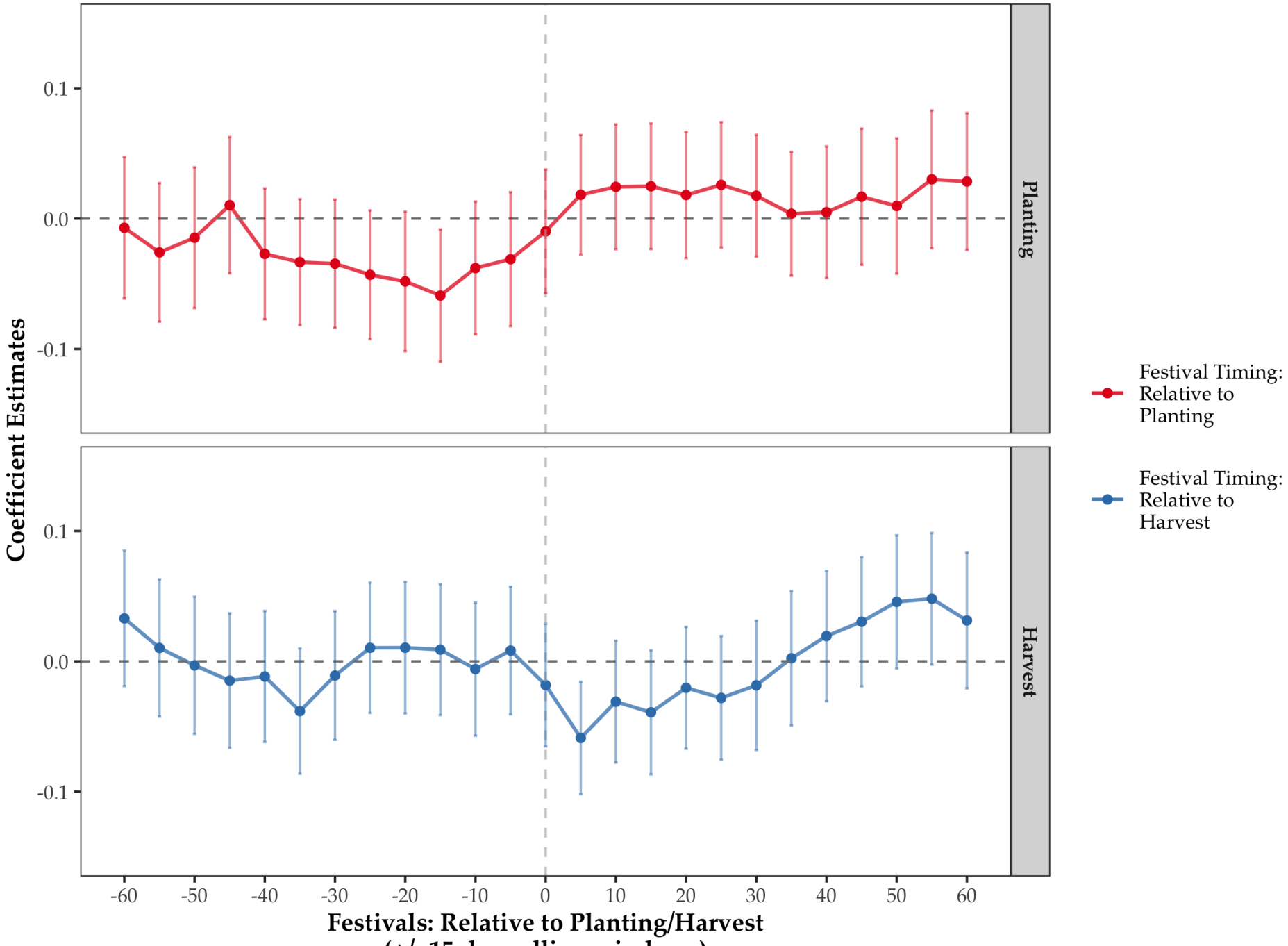
Table 6: Municipality Characteristics and Coinciding Festivals

	Non-Coinciding Festival			*Coinciding Festival*			Regression Estimates: *Coinciding Festival*		
	Obs.	Mean	SE	Obs.	Mean	SE	Coef.	SE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Geographic Characteristics:									
Precipitation	1406	95.12	(1.21)	187	97.70	(3.61)	-2.45	(3.49)	[3.13]
Temperature	1406	19.06	(0.11)	187	19.64	(0.27)	-0.08	(0.18)	[0.17]
Land Suitability	1406	86.48	(0.33)	187	84.61	(1.26)	-0.95	(0.94)	[1.00]
Maize Suitability	1406	34.51	(0.58)	187	34.78	(1.62)	2.58	(1.54)	[1.44]
Area	1406	328.13	(13.21)	187	341.75	(40.16)	-3.32	(36.20)	[36.03]
Longitude	1406	-98.32	(0.05)	187	-98.23	(0.15)	-0.05	(0.06)	[0.06]
Latitude	1406	18.65	(0.04)	187	18.79	(0.12)	0.06	(0.05)	[0.05]
Log(Dist. to Mexico City)	1406	5.42	(0.02)	187	5.52	(0.05)	-0.02	(0.02)	[0.02]
Slope	1406	10.35	(0.17)	187	9.54	(0.46)	-0.54	(0.46)	[0.45]
Elevation	1406	1572.20	(20.92)	187	1466.56	(57.63)	34.86	(35.99)	[34.38]
Colonial Characteristics:									
Has Colonial Characteristics (%)	1406	86.06	(0.92)	187	82.89	(2.76)	0.25	(2.90)	[2.73]
Drought in 1545 (%)	1210	99.67	(0.17)	155	98.06	(1.11)	-1.50	(0.90)	[1.02]
Log(Pop. Density in 1570)	1210	0.53	(0.03)	155	0.42	(0.08)	0.04	(0.06)	[0.04]

Notes: Observations are municipalities in the *New Spain* region of Mexico. *Coinciding Festival* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either within 0-30 days prior to the optimal maize planting date or 0-30 days after the optimal maize harvest date for a municipality using FAO GAEZ data, and 0 otherwise. The value displayed for regression estimates is the coefficient estimate for *Coinciding Festival*, conditional on state fixed effects, planting-month and harvest-month fixed effects, and festival month fixed effects. Robust standard errors are presented in parentheses. See Data Appendix for more information on variables. Note that we do not have colonial characteristics for all observations in our sample; therefore, we also show results for *Has Colonial Characteristics*, an indicator equal to 1 if a municipality is not missing colonial characteristics. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Municipalities where festivals overlap with planting/harvest are similar on important characteristics to municipalities without overlap ▸ Return

Impacts by Festival *Timing* Relative to Planting & Harvest



Robustness to Using Other Crops

Caloric Suitability Data

- Results so far only considered maize planting and harvest
- Exploit data on the potential caloric yield for crops across Mexico using the Caloric Suitability Index (CSI) measures developed by Galor and Ozak (2016)
  - Calculates the potential caloric yield per hectare under rain-fed agriculture and low level of inputs for many crops.
- Use the CSI data to determine the optimal planting and harvest date for the *highest caloric-yielding crop* in each municipality
  - Reassuringly, the highest caloric-yielding crop tends to be maize according to CSI: 73.15% of municipalities
  - Other max CSI crops across Mexico are: foxtail millet (9.93%), wetland rice (8.38%), wheat (5.25%), and groundnuts (0.53%)

Expanding Sample: All Mexican Municipalities

Table 7: Development Outcomes and Coinciding Festivals: All of Mexico

	Dependent Variable:				
	Panel A: *Log HH Income*				
	(1)	(2)	(3)	(4)	(5)
Festival Coincides with Maize Planting or Harvest	−0.009	−0.099	−0.138	−0.140	−0.110
	(0.080)	(0.063)	(0.056)	(0.056)	(0.060)
	[0.094]	[0.065]	[0.064]	[0.063]	[0.060]
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
Festival-Week Fixed Effects	N	N	N	N	Y
Observations	2,277	2,277	2,277	2,277	2,277
Adjusted R2	-0.000	0.351	0.518	0.522	0.534
Mean Dep. Var.	3.379	3.379	3.379	3.379	3.379
SD Dep. Var.	1.316	1.316	1.316	1.316	1.316

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 Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. *Geography Controls* includes mean temperature, mean precipitation, mean land suitability, the surface area, centroid latitude, centroid longitude, mean elevation, mean slope, log distance to Mexico City, and mean maize suitability for the municipality. *Colonial Controls* includes drought intensity in 1545 and log population density in 1570 using data from Sellers and Alix-Garcia (2018). For these colonial controls, values for municipalities with missing information are set to zero, and we control for an indicator variable equal to 1 if the municipality is not missing these colonial characteristics. *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. * $p < \mathbf{0.10}$, ** $p < \mathbf{0.05}$, *** $p < \mathbf{0.01}$.

▸ Return: By Month ▸ Return: Robustness

Aggregate Impact in New Spain

- How much lower is aggregate household income due to coinciding festivals?

$\Rightarrow$ We ask what our estimates would imply about aggregate GDP in the region if all municipalities with coinciding festivals instead had non-coinciding festivals

- In each municipality with a coinciding festival, increase 2010 municipality aggregate income by 20.6%, and population by 21.0% (regression estimates of impact of coinciding festivals)

- Then calculate counterfactual total income in the former New Spain

$\Rightarrow$ Aggregate GDP in the region is 4.2% lower due to coinciding festivals

▸ Return

Coinciding Festivals and Migration

Table 8: Impact of Agriculturally-Coinciding Festivals on Migration Outcomes

	Dependent Variables:			
	% Born in a Different State	*% Different Municipality 5 Years Ago*	*% Different State 5 Years Ago*	*% Different Country 5 Years Ago*
	(1)	(2)	(3)	(4)
Festival Coincides with Maize Planting or Harvest	−0.007	−0.001	−0.003	0.004
	(0.006)	(0.002)	(0.001)	(0.001)
	[0.005]	[0.002]	[0.001]	[0.001]
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
Festival-Week Fixed Effects	Y	Y	Y	Y
Observations	1,593	1,593	1,593	1,593
Adjusted R2	0.546	0.198	0.199	0.299
Mean Dep. Var.	0.085	0.023	0.025	0.018
SD Dep. Var.	0.103	0.029	0.022	0.015

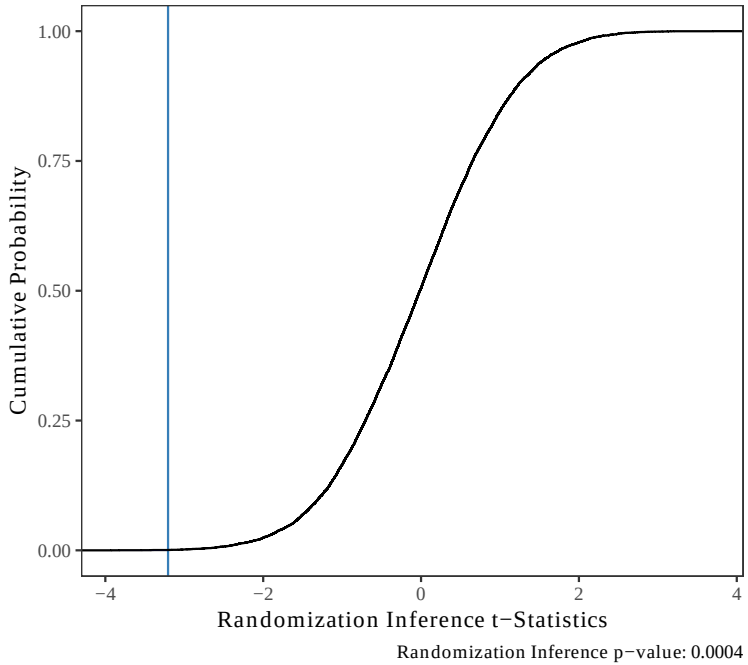
Notes: Data is from the 2010 Population Census. Observations are municipalities in the *New Spain* region of Mexico. Standard errors are clustered at the municipality level. *% Born in a Different State* is the share of individuals in a municipality that report being born in a different state than their current state of residence. *% Different Municipality 5 Years Ago* is the share of individuals in a municipality who report having lived in a different municipality (but within the same state) five years ago. *% Different State 5 Years Ago* is the share of individuals in a municipality who report having lived in a different state five years ago. *% Different Country 5 Years Ago* is the share of individuals in a municipality who report having lived abroad five years ago. *Festival Coincides with Maize Planting or Harvest* is an indicator variable equal to 1 if the saint day festival in a municipality occurs either 0 to 30 days prior to the optimal maize planting date or 0 to 30 days after the optimal maize harvest date for a municipality using FAO GAEZ data. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Suggestive evidence that coinciding festivals are associated with higher international out-migration

▸ Return

Randomization Inference Exercise

Figure 20: Randomization Inference Exercise – Placebo Festivals



Notes: The figure presents the cumulative distribution function 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 coincides with planting or harvest for each municipality and estimate our main specification, and then plot the cumulative distribution function for the estimated t-statistics. The dependent variable is *Log Household Income*. All regressions include state fixed effects, *Geography Controls*, *Colonial Controls*, *Festival-Week Fixed Effects*, and *Planting- & Harvest-Month Fixed Effects*. Observations are municipalities in the *New Spain* region of Mexico. Additionally, the figure presents the estimated t-statistic for our sample, and reports the randomization inference p-value on the bottom right of the figure.

▸ Return