Unintentional consequences of the Drug War in Mexico, 2005-2012

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PSE

Master thesis

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Overview

Context - How the Mexican drug war started?

- In December 2006, after 10 days in office, former President Calderon sent military and federal forces to the State of Michoacan, marking the beginning of the drug war in Mexico.
- Confrontational approach departing traditional strategy (seizure of shipments and crop fields)
- No signs in the political campaign, nor official communication with counterparts to implement such strategy (US-certification program, UN, States Federation, etc.)
- In fact, number of DTO very stable across time, and very low-profile criminality among the population (See Annex, [7])
- The government's new strategy consisted in sending federal forces to municipalities with two main task: 1) capturing DTO kingpins, and; 2) dismantling DTO operations

Context - Who was in for implementing the new strategy?

- Mexico is a federation and each State and municipality has his own police department, and autonomy over their territory.
- In theory, for implementing the new strategy the federal forces needed a *"formal request"* for assistance from the State or Municipality.
- Government reserved these information (and in most of the cases it didn't exist [ASM19])

Context - Who was in for implementing the new strategy?

- Some research used the political affiliation ([Del15]) or the government's press conferences ([CRDCM15]) to proxy the lack of these information.
- However, even the information provided for the government (press conferences) in some cases are inaccurate ([ASM19]) or the party affiliation is not a deterministic factor to implement the new strategy

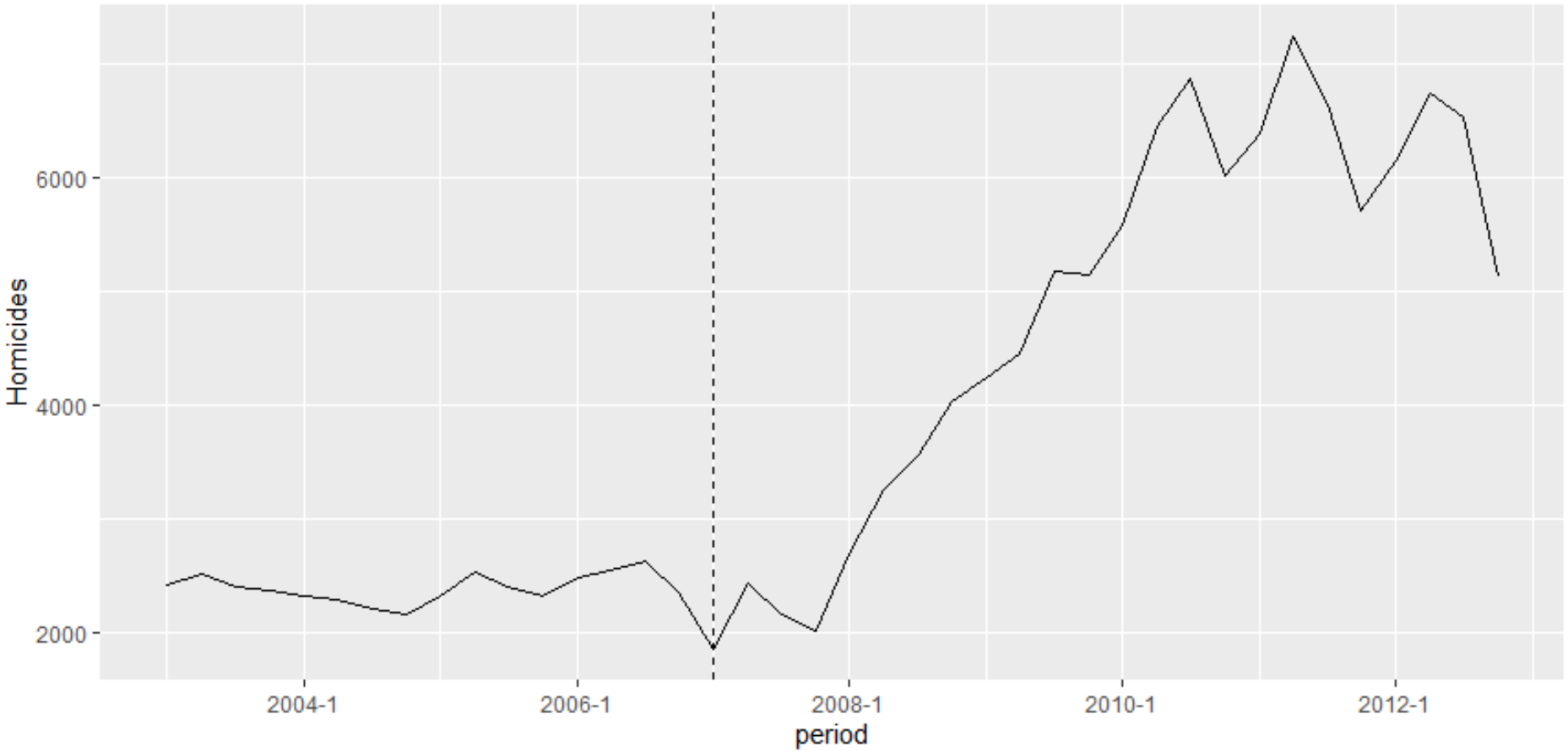
Table: Party affiliation and policy implementation

	President's party	Not President's party
Adopt Policy	19	45
No Adopt Policy	32	93

Source: Own elaboration using the time period, narrow margin defined by [Del15], electoral data (INEGI), and data from [ASM19]

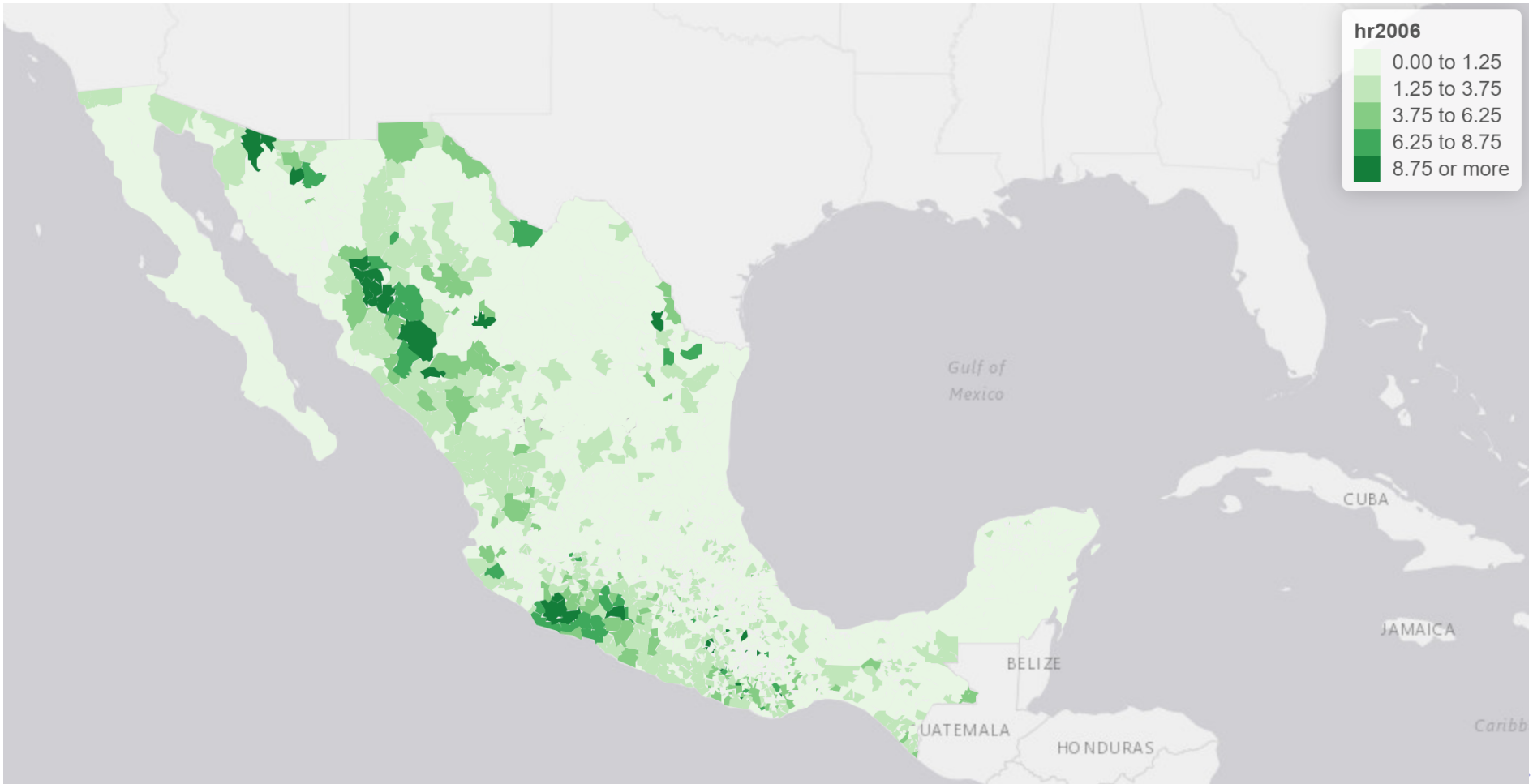
In the blink of an eye: Two recurring figures in the lit

Figure: Violent Homicides in Mexico



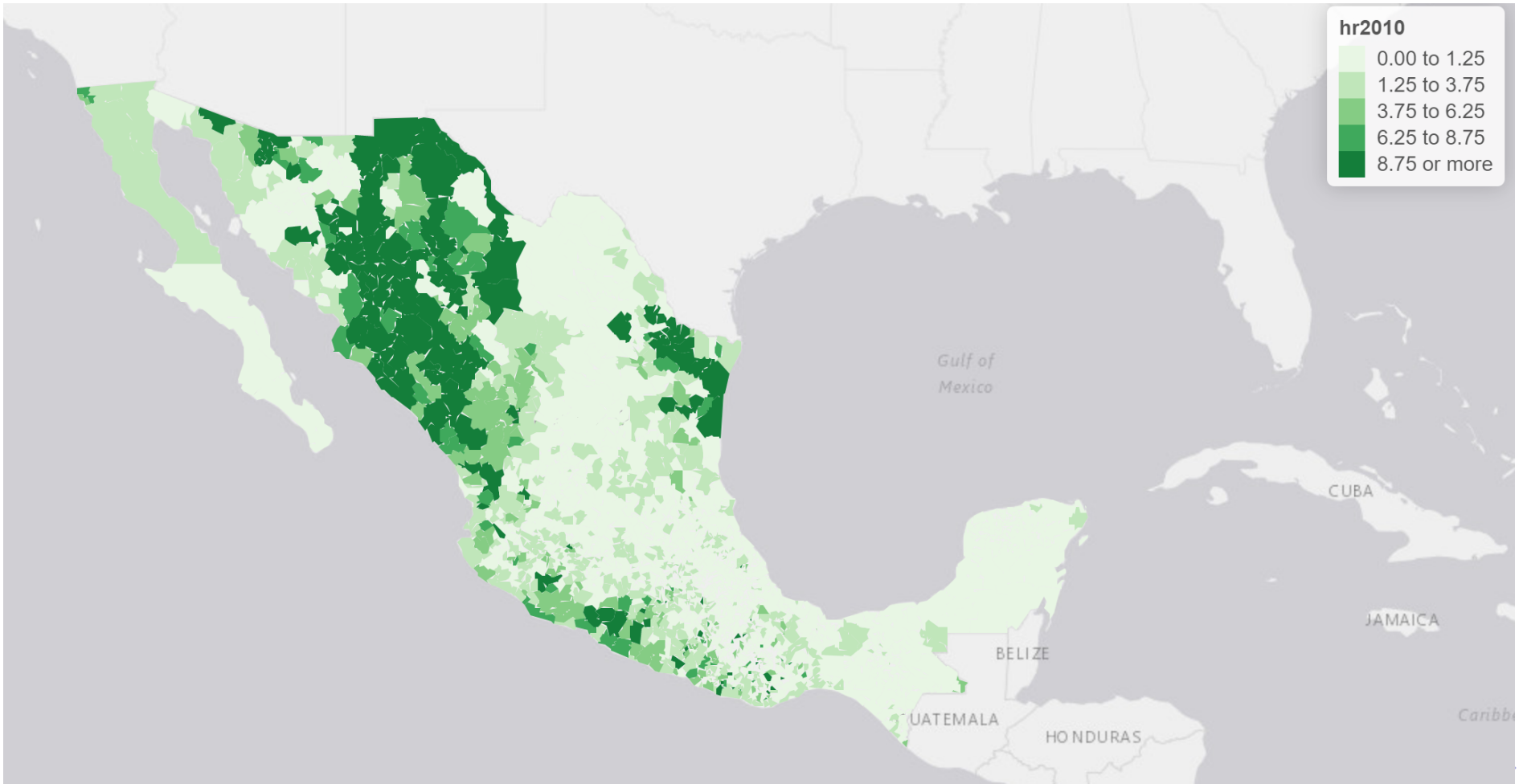
In the blink of an eye: Two recurring figures in the lit

Figure: Violent Homicides in Mexico 2006



In the blink of an eye: Two recurring figures

Figure: Violent Homicides in Mexico 2010



New strategy proxies → violent homicides

Party affiliation

- [Del15]: RD design - 5% narrow margin win/lost President's party affiliated mayors -
- Municipalities where the mayor is affiliated to the President's party experienced an increase in violent homicides
- [Del15]-Extension: Spillover network trafficking model - At municipal aggregates, the women reduce their labor participation due to new strategy implementation

Press conferences

- [CRDCM15]: Time-event study - pooled data 6 month before and after neutralizing a DTO kingpin or a lieutenant
- The violence generated by lieutenant neutralization generate a short-term increase in violence among cartels while kingpin neutralization a long-lasting violence that permeates into the society.

Violent homicides → Labor outcomes

- [Vel19]: Panel data MXFLS - identification strategy leverages the rapid, unprecedented, and arguably unexpected increase in the level and location of violence in Mexico
- Violence impact negatively labor outcomes: Men reduce earnings and productivity, women reduce hours worked - suggestive evidence on fear of victimization as mechanism.
- [BP19]: Panel rotation data ENOE - IV Regression (highways km x cocaine seizures)
- Homicides lead to reductions in employment, for non-breadwinners. Violence increases hours worked but does not change monthly income: shifts out of higher paid formal to lower paid informal.
- [Uta18]: Panel data on manufacturing firms EIM - IV Regression (DTO territory x Confrontation x Price Cocaine)
- Negative impact of the violence on plants' output, product scope, employment and capacity utilization

Violent homicides → Behavioral outcomes

Behavioral:

- [BMTV19]: spatio-temporal variation in homicides as identification strategy - Increase in violence → increase in risk aversion
- [Bal19]: spatio-temporal variation in homicides as identification strategy - Increase in violence → refrained the population from going out at night (6.72%), carrying cash (3.52%), and using public transportation (1.20%)
- [BGGH20]: spatio-temporal variation in homicides as identification strategy - Increase in violence → reduce expenditure on visible commodities (e.g. house construction) in middle and upper-income households, while in low-income households reduce the times individuals carrying valuables and going out at night.

Violent homicides → Other outcomes

- [TG20]: Increase in violence reduce the probability of teenage pregnancy by approximately 1.5%, and that effect is more acute among women with worse economic conditions.
- [Bro18]: Early gestational exposure to the recent escalation of the Mexican Drug War is associated with a substantial decrease in birth weight. The effect is stronger among children born to mothers who score poorly on a mental health index and who comes from a low socioeconomic status.
- [JMFR16]: increase in violence have had negative effects on math test scores. Potential mechanisms driving the effects is the loss of instructional time due to higher teacher absenteeism and turnover, as well as student absenteeism, tardiness, and propensity to leave school days early.
- Other outcomes in Foreign Direct Investment [CMS19]; State's GDP per capita [PWE12] and [BH18]; incoming of tourist [Cor18]; and income growth [ELCRC14].

Contribution

- Unlike previous research, I use a direct measure of strategy implementation, that is, a detailed account of operations carried out by public forces.
- Although violent homicides is the final measure of the Mexican drug war conflict, other activities which not caused deaths can affect individuals choices (e.g. patrolling, military convoys)
- I use a time-event framework following [BJ18] in which the event is unpredictable conditional on unit characteristics.

Data

- Three main sources: Employment Survey (ENOE); DTO territories [CR12]; and Records of public force confrontations [ASM19].
- Control: set of municipalities that before 2007 have cohabited w/ DTO;
- Treatment: set of municipalities that before 2007 have never cohabited w/ DTO, but they are the target of the new security strategy.
- Non-Treated: set of municipalities that have never cohabited w/ DTO, nor have ever been exposed to a federal public force operation

Year	Municipalities
2007	13
2008	53
2009	37
2010	57
2011	53

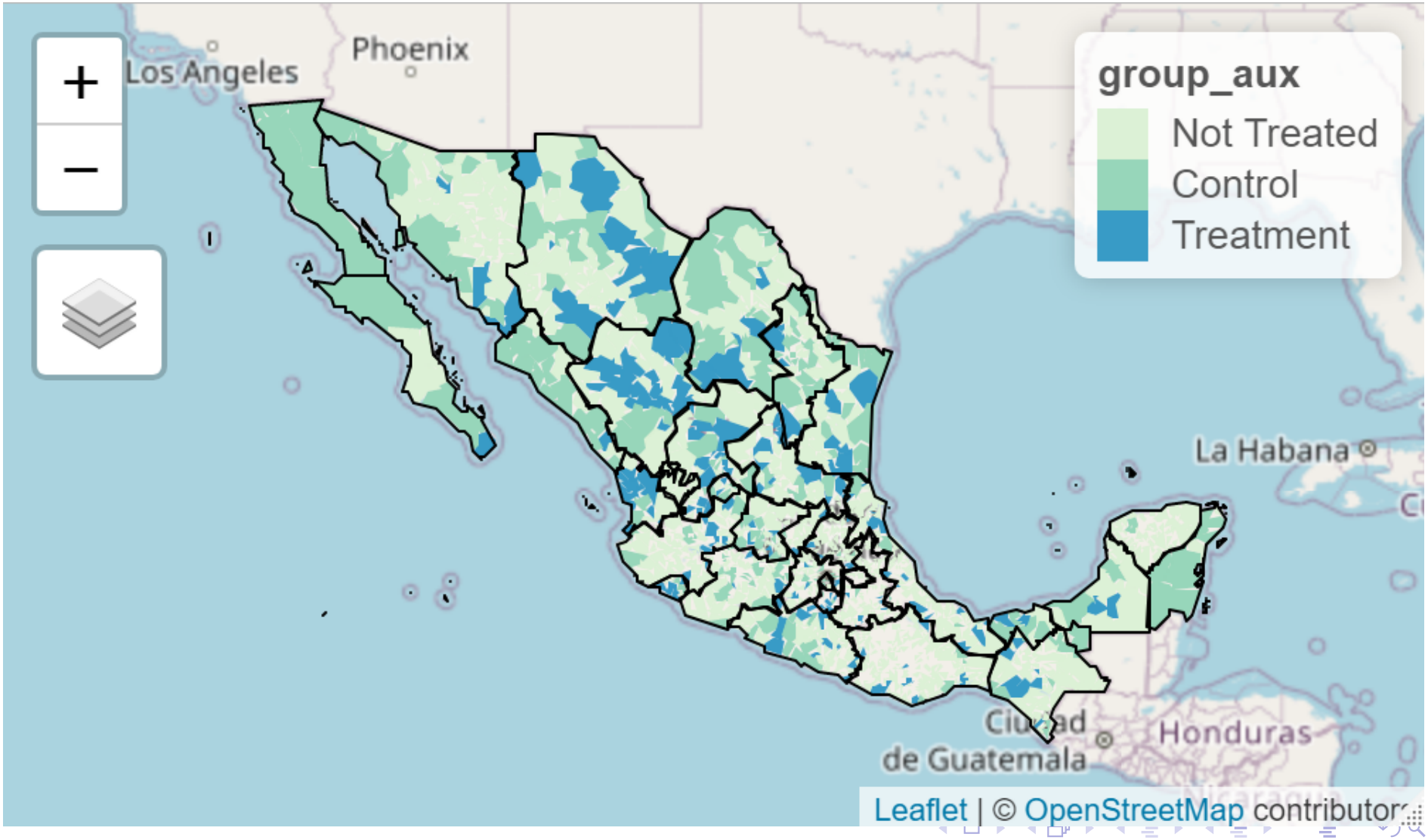
Some summary statistics

Table: Summary statistics 2005-2006 (weighted mean)

	Treated	Control	Diff.	SE	p-value
Employed	0.52	0.54	-0.02	0.00	0.00
Formal	0.19	0.27	-0.08	0.00	0.00
Age	35.92	35.95	-0.04	0.03	0.28
Years of study	7.59	8.81	-1.22	0.01	0.00
Married	0.54	0.53	0.01	0.00	0.00
Female	0.53	0.53	0.00	0.00	0.00
Family members	4.84	4.65	0.19	0.00	0.00
ITAE	108.67	109.41	-0.74	0.01	0.00
n Municipalities	213	254			
n individuals	121,072	601,805			
N	353,519	1,743,999			

Source: Own elaboration with data from ENOE

Control and Treatment Group



Empirical method and specification (Full-Dynamic)

- Following [BJ18], time-event studies with unit and time FE suffer from under-identification caused by the age-period-cohort problem. He proposed restrict pre-trend (i.e. which means time-randomness of events), and pick reference categories with some separation.

$$Y_{imt} = \alpha_m + \beta_t + \sum_{-\infty}^{\infty} \gamma_k 1[K_{mt} = k] + \epsilon_{imt}$$

  with $K_{mt} = t - E_m$

- To have a balanced panel in which each cohort (i.e. quarter-year) provides information, I can only go 8 quarters before the treatment, and 4 quarters after (Annex, [41])

Empirical method and specification (Semi-Dynamic and Static)

- Once validated the time-randomness assumption (with visual or F-statistics over the restrictions), the next step proposed by [BJ18] is to estimate the semi-dynamic (or restricted) equation

$$Y_{imt} = \alpha_m + \beta_t + \sum_{k=0}^{k=4} \gamma_k 1[K_{mt} = k] + \epsilon_{imt}$$

- Another way to estimate the relationship is with a Static form:

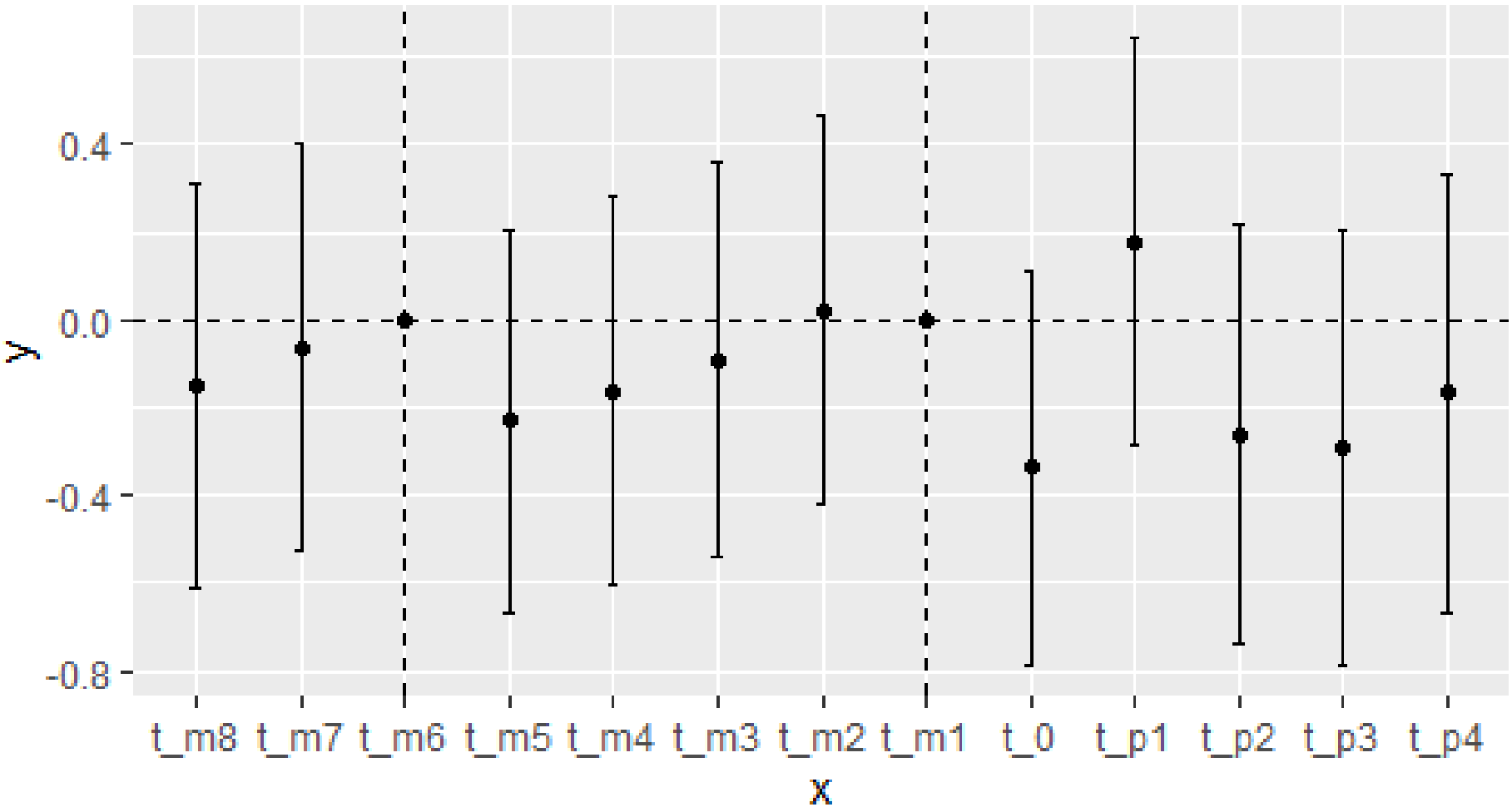
$$Y_{imt} = \alpha_m + \beta_t + \gamma D_{it} + \epsilon_{it}$$

with $D_{it} = 1[K_{it} \geq 0]$

- [BJ18] pointed an under-identification coming from the time-FE that is easily solve with an adequate and big control group.

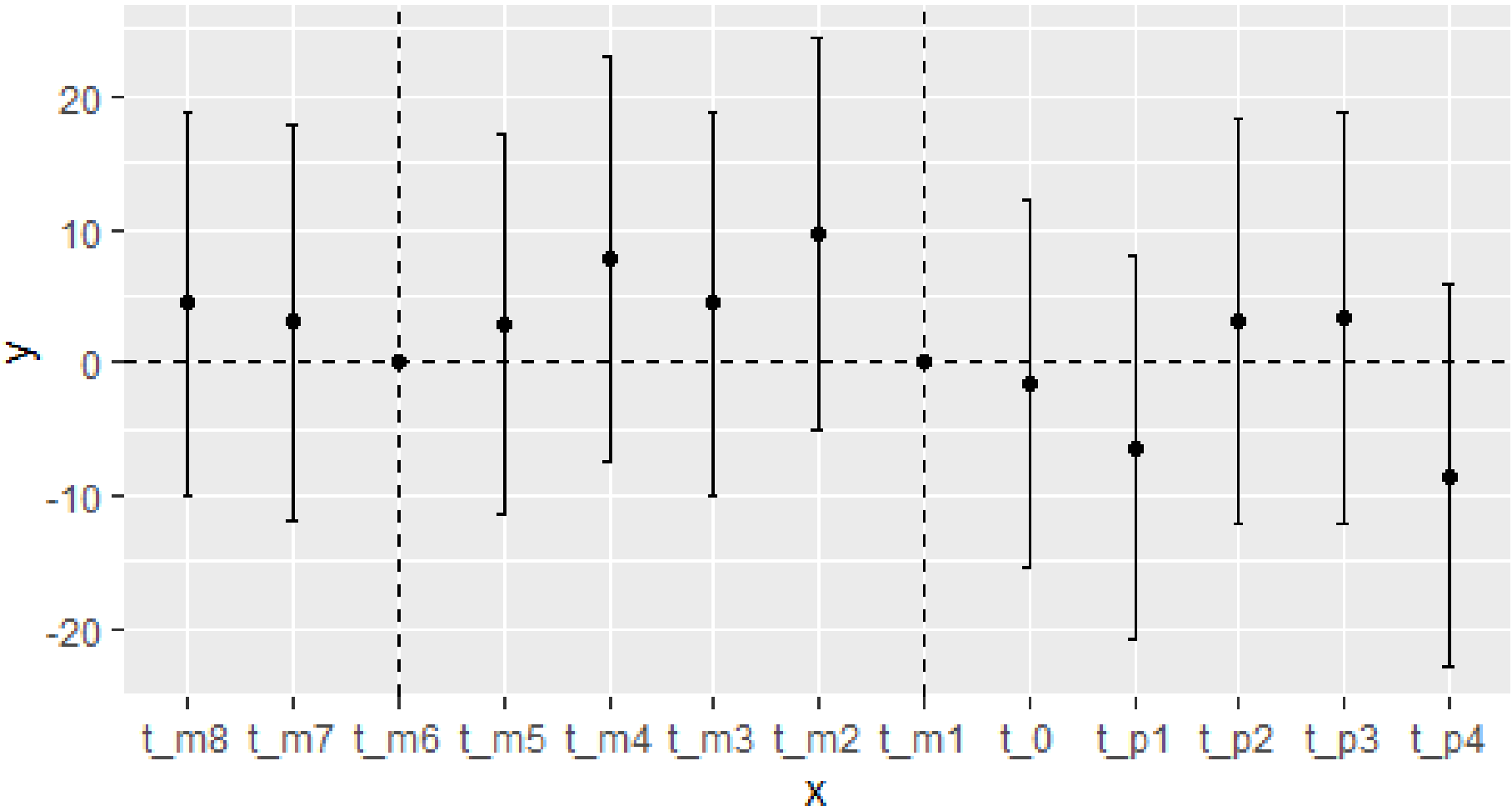
Validation - Hours worked

Ho: $\gamma_{m8} = \gamma_{m7} = ... = \gamma_{m1} = 0$ with a $Pr(> Chisq) = 0.952$

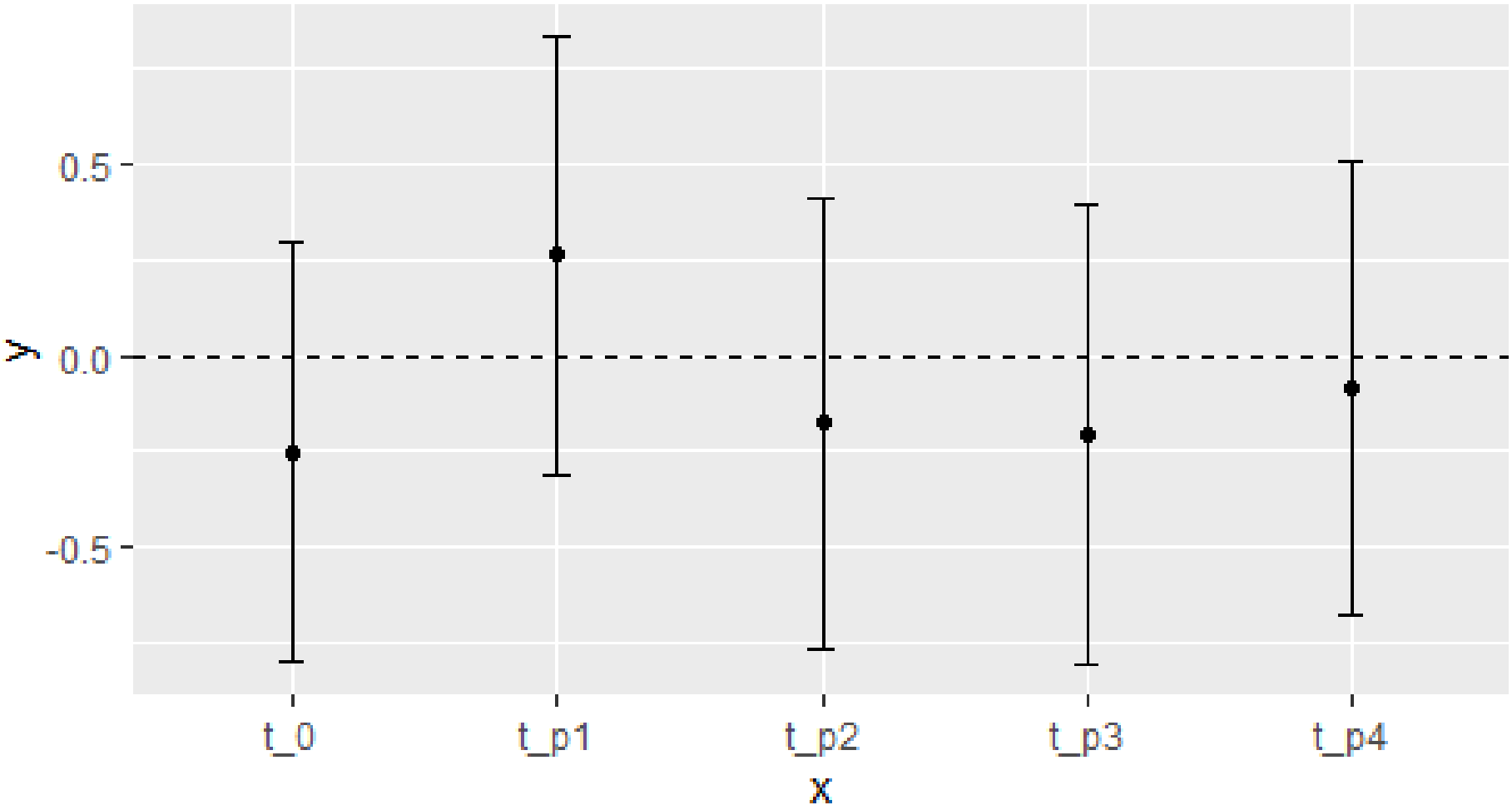


Validation - Outdoor time

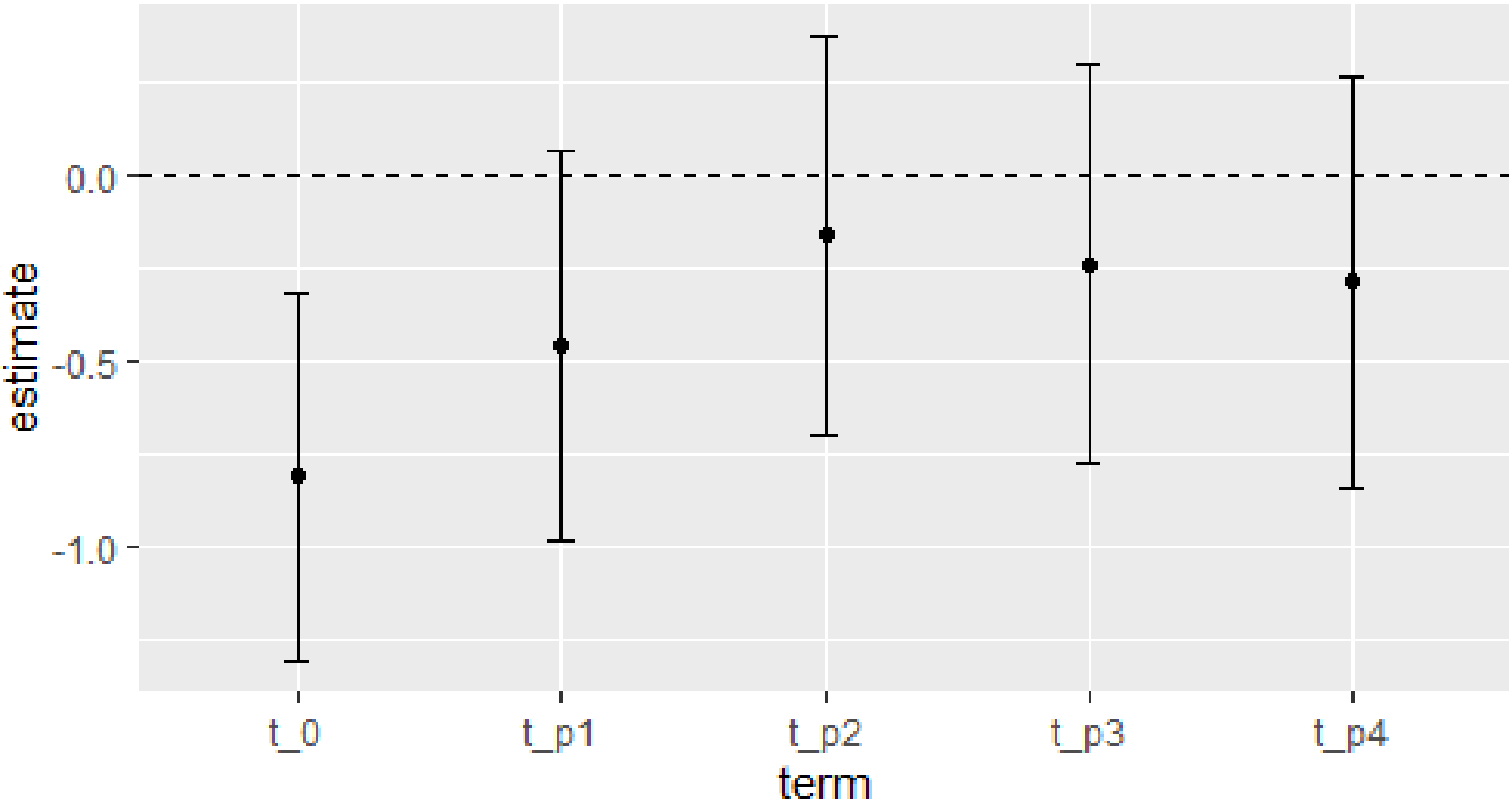
Ho: $\gamma_{m8} = \gamma_{m7} = ... = \gamma_{m1} = 0$ with a $Pr(> Chiq) = 0.3828$



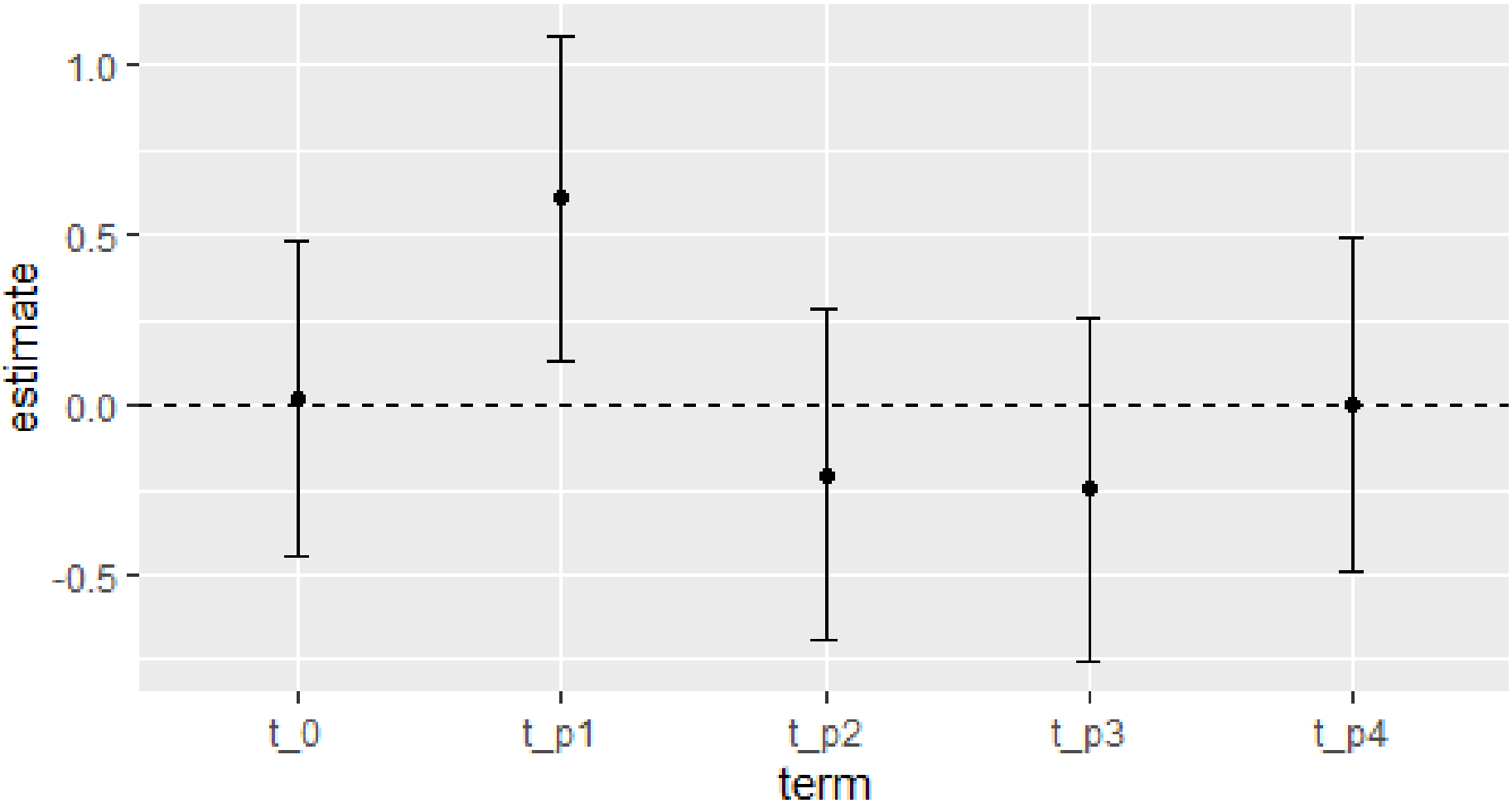
Semi-dynamic-Hours worked



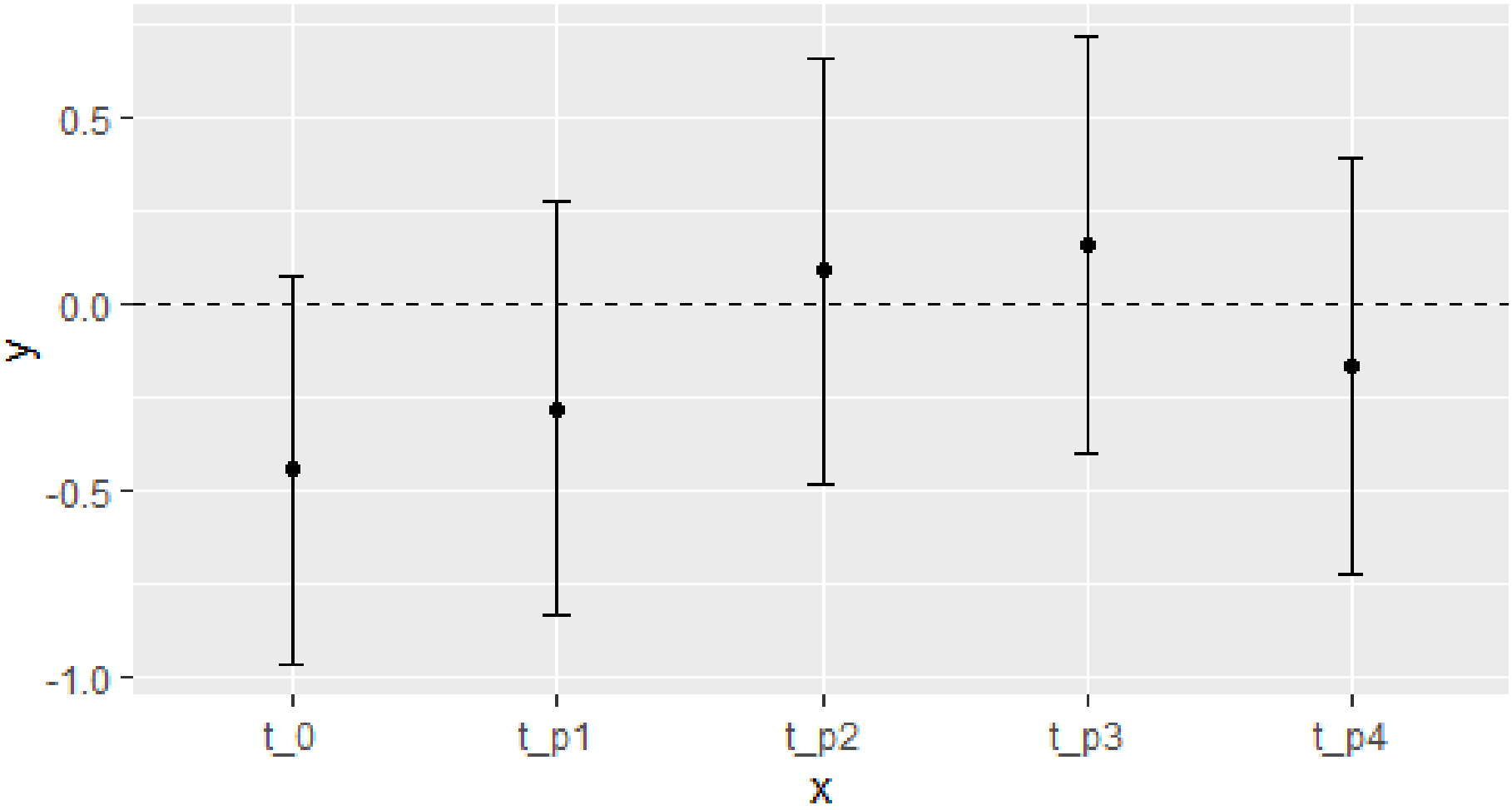
Semi-dynamic-Hours worked / Formal



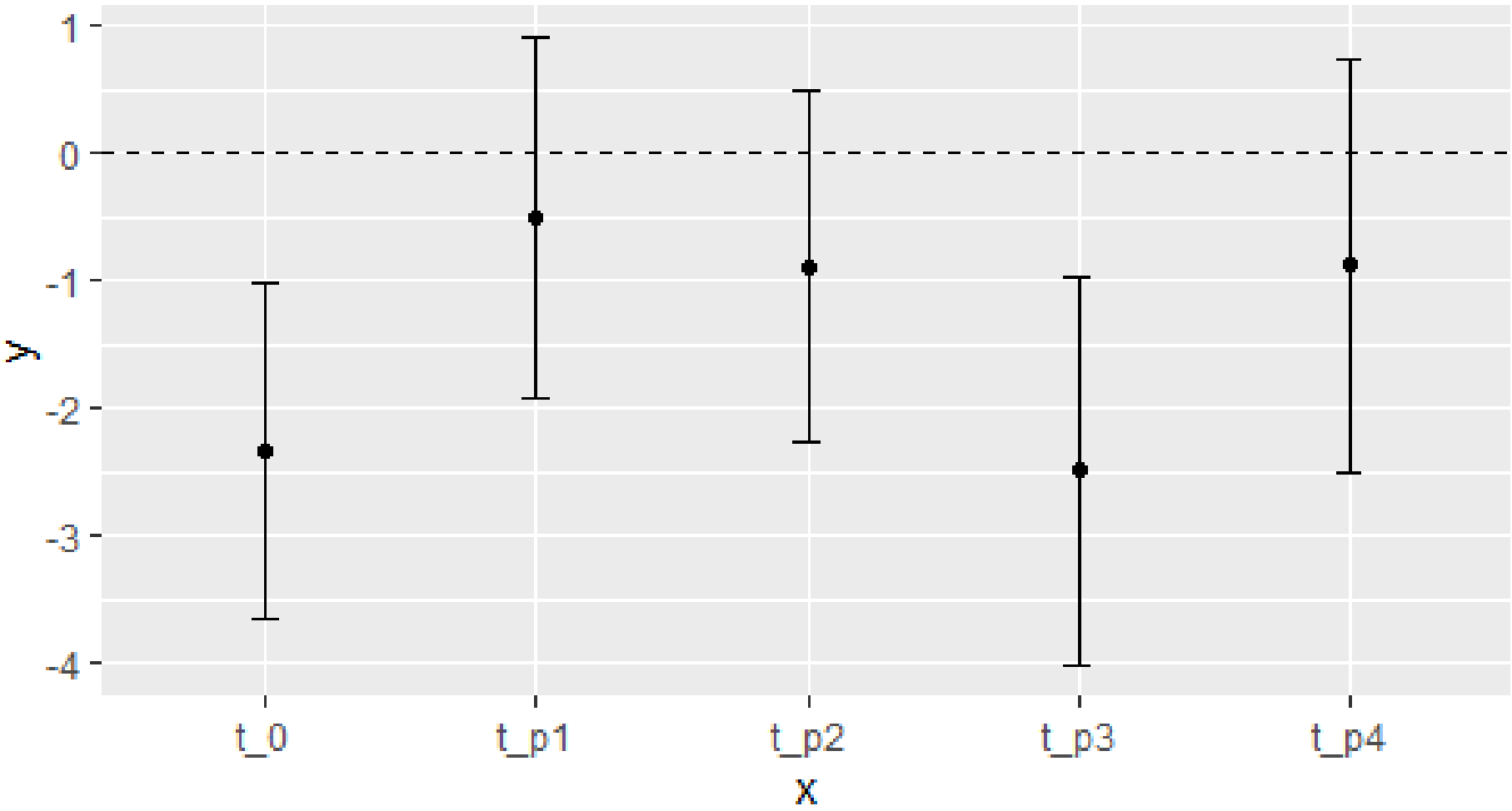
Semi-dynamic-Hours worked / Informal



Semi-dynamic-Hours worked / Formal attached



Semi-dynamic-Hours worked / Formal not-attached



Static-Hours worked

Table: Hours worked - Static specification

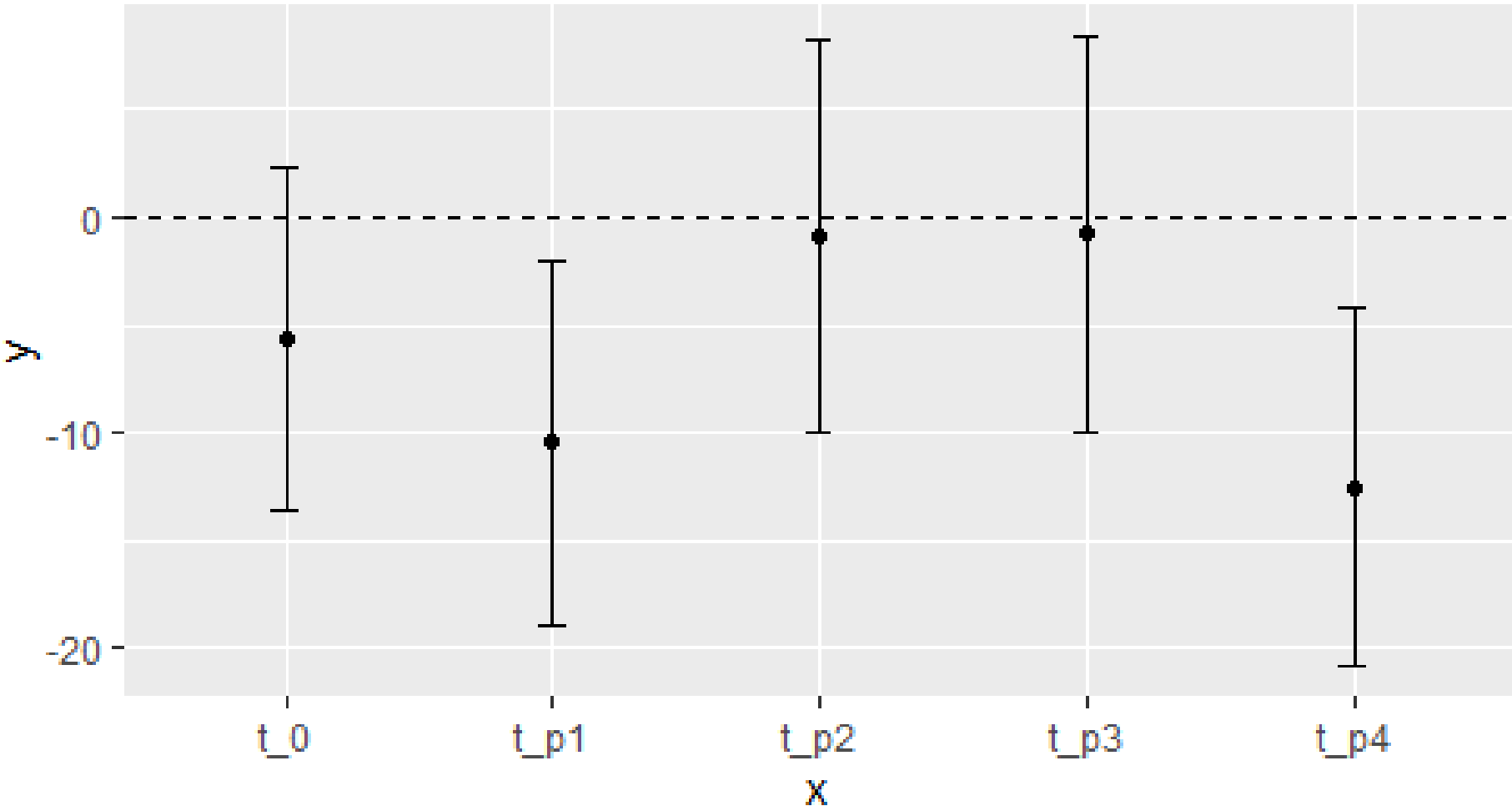
	General		Female		Male		Informal		Formal	
Treatment	-0.093	-0.114	0.002	-0.036	-0.046	-0.090	0.031	0.003	-0.393*	-0.382*
Municipal FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N	4,046,889		1,608,127		2,438,760		1,992,361		2,054,527	
n clusters	573,244		401,967		505,600		440,763		437,089	

* p ¡ 0.10, ** p ¡ 0.05, *** p ¡ 0.01:

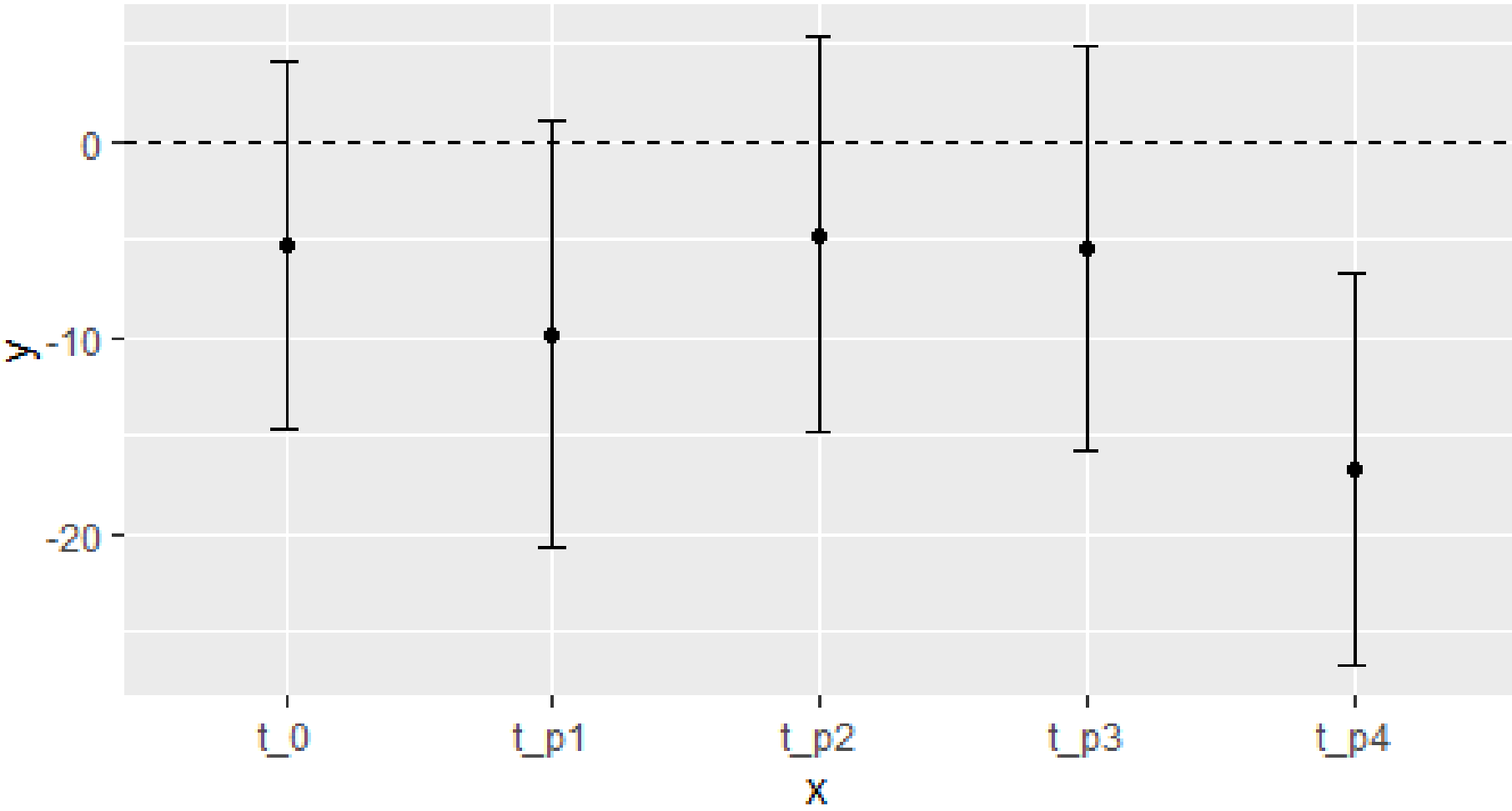
Notes: Standard errors are clustered at the household level. Time FE are quarter-year.

Controls include age, years of school, marriage status, number of family members, and an index of State's economic activity

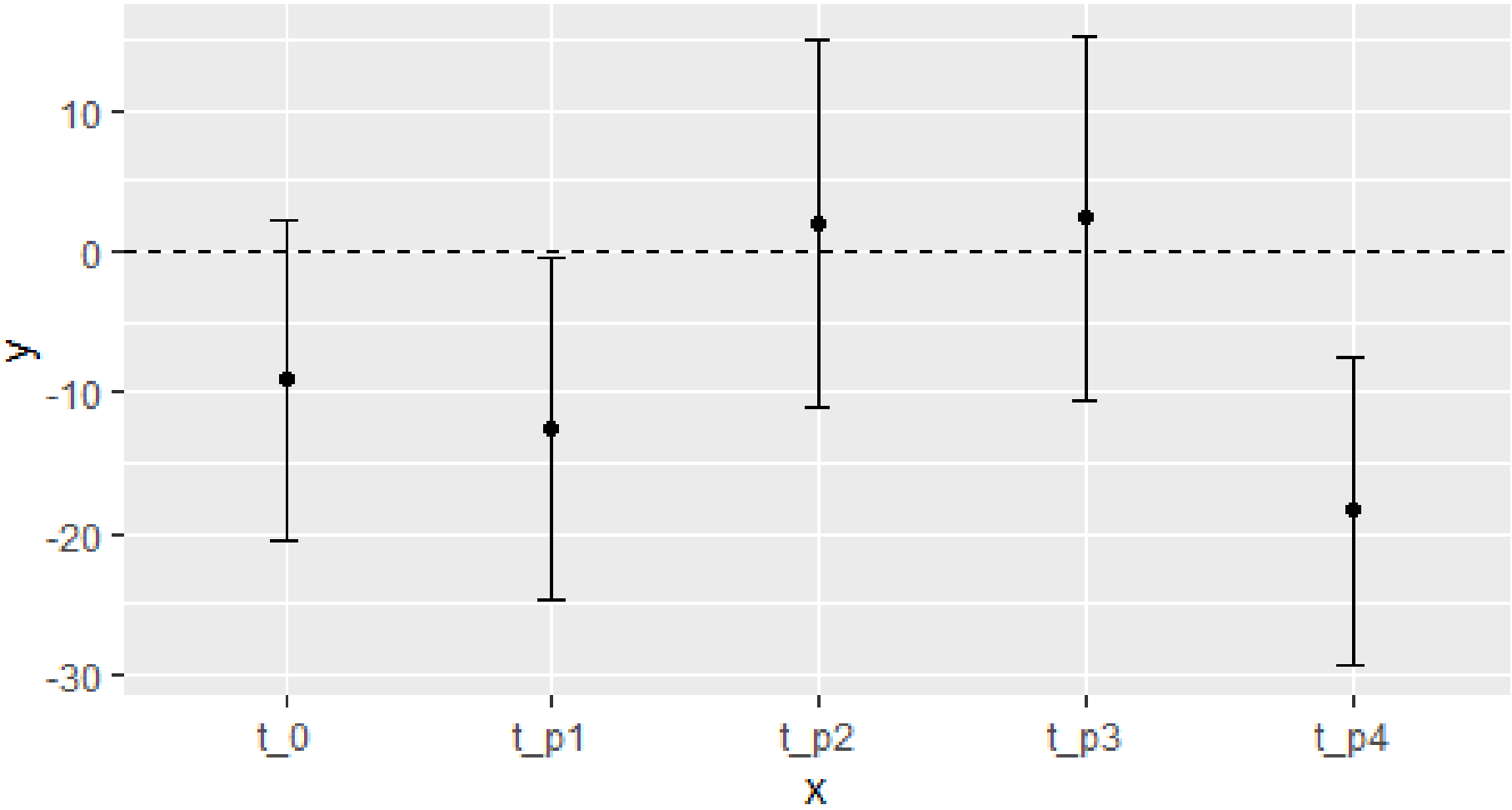
Semi-dynamic-Outdoor time



Semi-dynamic-Outdoor time / Male



Semi-dynamic-Outdoor time / Informal



Semi-dynamic-Outdoor time / Informal

Table: Time spent in outdoor activities - Static specification

	General		Female		Male		Informal		Formal	
Treatment	-6.052*	-6.474*	-2.345	-2.972	-8.364**	-7.920**	-7.115	-7.202	-2.006	-2.839
Municipal FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N	4,046,884		1,608,127		2,438,760		1,992,361		2,054,527	
n clusters	573,244		401,967		505,600		440,763		437,089	

Conclusion and further research

- The new strategy have impacted the hours worked differently for informal and formal individuals
- informal employees increase the number of hours worked,
- Formal employees reduce their number of hours worked. This effect is drive mainly for the individuals who doesn't have any benefit from their job (weak attachment)
- The new strategy also impacted the outdoor time spent by individual.
- In the panel (with attrition), only the males and informal employees reduce their exposition time
- In the panel (with no-attrition), all the individuals reduce their exposition, with woman and informal reacting the strongest.
- New research can take advantage on the novel data set and look into the effect caused by different public forces (military, navy, federal police) or mechanism that explains the effects found.

References I

- Laura H Atuesta, Oscar S Siordia, and Alejandro M Madrazo, *The "War on Drugs" in Mexico: (Official) Database of Events between December 2006 and November 2011*, Journal of Conflict Resolution **63** (2019), no. 7, 1765–1789.
- Jose Roberto Balmori De La Miyar, *Violence and Avoidance Behavior: The Case of the Mexican Drug War*, Peace Economics, Peace Science and Public Policy **25** (2019), no. 4.
- Luisa Blanco, Robin Grier, Kevin Grier, and Daniel Hicks, *Household responses to escalating violence in Mexico*, Applied Economics Letters (2020).
- Germà Bel and Maximilian Holst, *Assessing the effects of the Mexican Drug War on economic growth: An empirical analysis*, Southern Economic Journal **85** (2018), no. 1, 276–303.

References II

- Kirill Borusyak and Xavier Jaravel, *Revisiting Event Study Designs with an Application to the Estimation of the Marginal Propensity to Consume*, 1–35.
- Ryan Brown, Verónica Montalva, Duncan Thomas, and Andrea Velásquez, *Impact of violent crime on risk aversion: Evidence from the mexican drug war*, Review of Economics and Statistics **101** (2019), no. 5, 892–904.
- Sukanya Basu and Sarah Pearlman, *Violence and labor market responses: evidence from Mexico's drug war*.
- Ryan Brown, *The Mexican Drug War and Early-Life Health: The Impact of Violent Crime on Birth Outcomes*, Demography **55** (2018), no. 1, 319–340.

References III


René Cabral, André Varella Mollick, and Eduardo Saucedo, *Foreign direct investment in Mexico, crime, and economic forces*, Contemporary Economic Policy **37** (2019), no. 1, 68–85.


Nicolas Corona, *Does violent crime scare tourist away? Panel data evidence from 32 mexican states*, EconoQuantum **15** (2018), no. 2.


Michele Coscia and Viridiana Rios, *Knowing Where and How Criminal Organizations Operate Using Web Content*, CIKM **12** (2012), 1412–1421.


Gabriela Calderón, Gustavo Robles, Alberto Díaz-Cayeros, and Beatriz Magaloni, *The Beheading of Criminal Organizations and the Dynamics of Violence in Mexico*, Journal of Conflict Resolution **59** (2015), no. 8, 1455–1485.

References IV

- Melissa Dell, *Trafficking networks and the Mexican drug war*, American Economic Review **105** (2015), no. 6, 1738–1779.
- Ted Enamorado, Luis F. López-Calva, and Carlos Rodríguez-Castelán, *Crime and growth convergence: Evidence from Mexico*, Economics Letters **125** (2014), no. 1, 9–13.
- Brenda Jarillo, Beatriz Magaloni, Edgar Franco, and Gustavo Robles, *How the Mexican drug war affects kids and schools? Evidence on effects and mechanisms*, International Journal of Educational Development **51** (2016), 135–146.
- Mingming Pan, Benjamin Widner, and Carl E. Enomoto, *Growth and crime in contiguous States of Mexico*, Review of Urban & Regional Development Studies **24** (2012), no. 1-2, 51–64.

References V


Magda Tsaneva and Pinar Mine Gunes, *The effect of violent crime on teenage pregnancy in Mexico*, Review of Economics of the Household **18** (2020), no. 1, 141–164.


Hâle Utar, *Firms and Labor in Times of Violence: Evidence from the Mexican Drug War*, CESifo Working Papers (2018).

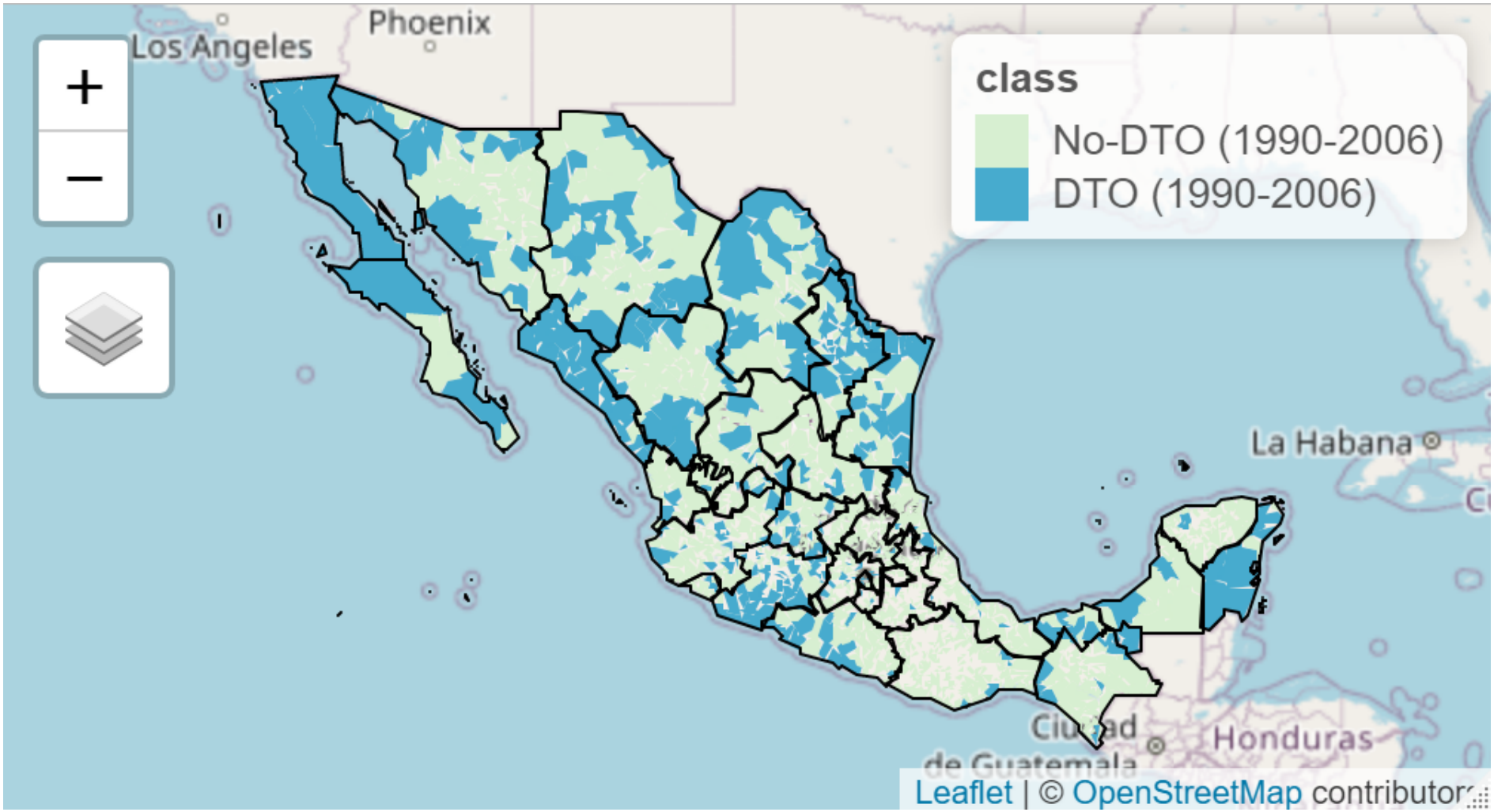

Andrea Velásquez, *The Economic Burden of Crime: Evidence from Mexico*, Journal of Human Resources (2019), no. February, 0716–8072r2.

Muchas gracias!

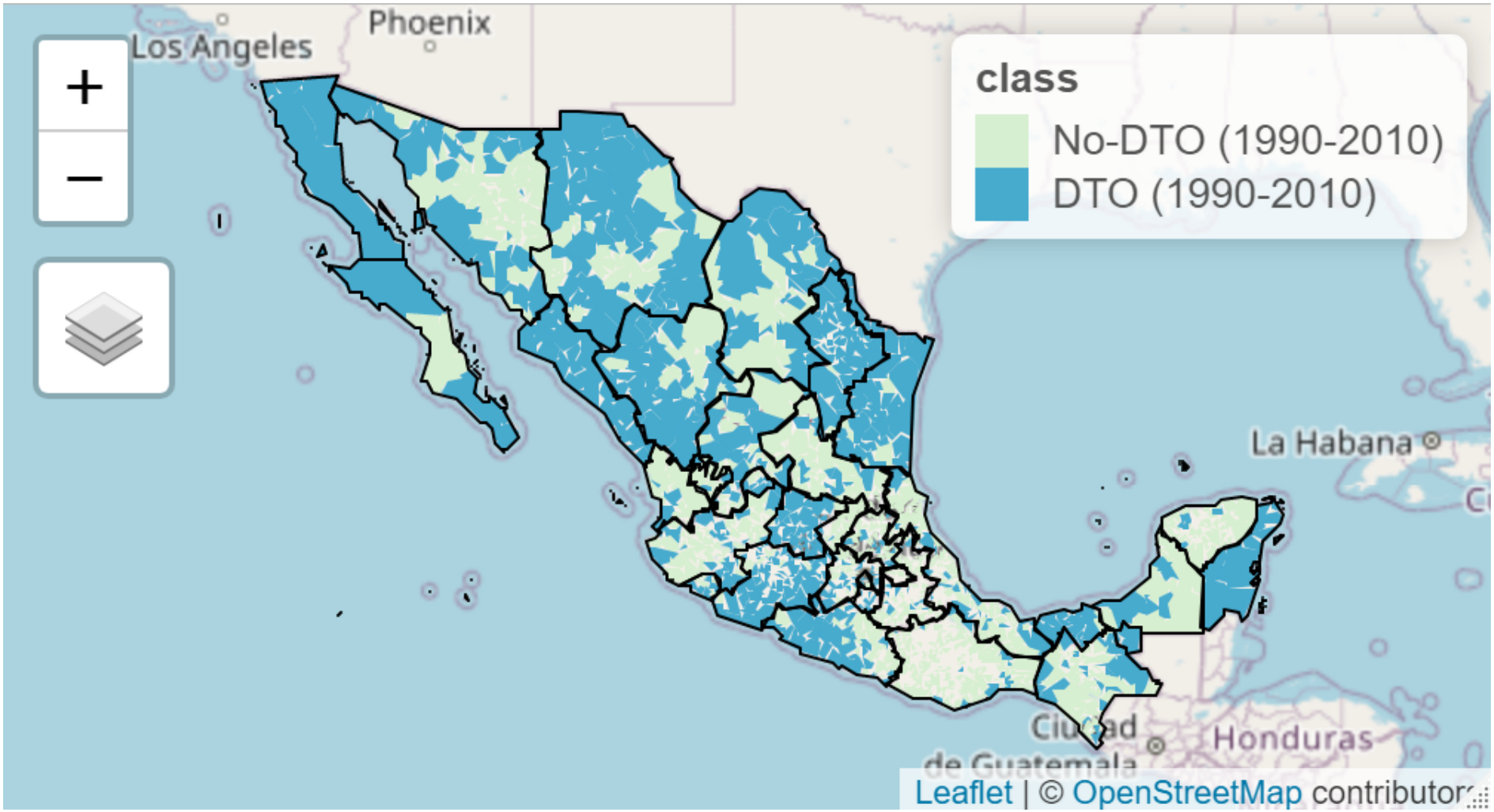
Annex-Fragmentation of DTO

2006	2007-2009	2010 (1st Semester)	2010 (2nd Semester)	2011
Cártel de Sinaloa	Cártel de Sinaloa	Cártel de Sinaloa	Cártel de Sinaloa	Cártel de Sinaloa
	Cártel de los Beltrán Leyva	Cártel del Pacífico Sur	Cártel del Pacífico Sur	Cártel del Pacífico Sur
				La Mano con Ojos
				La Nueva Administración
		Cártel de la Barbie	Cártel Independiente de Acapulco	Cártel Independiente de Acapulco
			Cártel del Charro	Cártel del Charro
Cártel de Juárez	Cártel de Juárez	Cártel de Juárez	Cártel de Juárez	Cártel de Juárez
Cártel de Tijuana	Cártel de Tijuana	Cártel de Tijuana	Cártel de Tijuana	Cártel de Tijuana
	Facción de El Teo	Facción de El Teo		
Cártel del Golfo	Cártel del Golfo-Zetas	Cártel del Golfo	Cártel del Golfo	Cártel del Golfo
		Los Zetas	Los Zetas	Los Zetas
La Familia Michoacana	La Familia Michoacana	La Familia Michoacana	La Familia Michoacana	Los Caballeros Templarios
				Los Incorregibles
				La Empresa
Cártel del Milenio	Cártel del Milenio	Cártel del Milenio	La Resistencia	La Resistencia
			Cártel de Jalisco-Nueva Generación	Cártel de Jalisco- Nueva Generación
-	-	-	-	La Nueva Federación para Vivir Mejor
6	8	10	11	16

Annex- DTO territory (1990-2006)



Annex- DTO territory (1990-2010)



Annex- Year-Cohort Sample

Date/Cohort	2007-1	2007-2	2007-3	2007-4	2008-1	2008-2	2008-3	2008-4	2009-1	2009-2	2009-3	2009-4	2010-1	2010-2	2010-3	2010-4	2011-1	2011-2	2011-3	2011-4
2005-1	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27
2005-2	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26
2005-3	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25
2005-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24
2006-1	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23
2006-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22
2006-3	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21
2006-4	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20
2007-1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19
2007-2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18
2007-3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17
2007-4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16
2008-1	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15
2008-2	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14
2008-3	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13
2008-4	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12
2009-1	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11
2009-2	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
2009-3	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8	-9
2009-4	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7	-8
2010-1	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6	-7
2010-2	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5	-6
2010-3	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4	-5
2010-4	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3	-4
2011-1	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2	-3
2011-2	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1	-2
2011-3	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**	-1
2011-4	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	**0**
2012-1	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
2012-2	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
2012-3	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3
2012-4	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4