THREE ESSAYS ON THE ECONOMICS OF CRIME AND GENDER

by

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Abstract

This thesis focuses on intimate partner violence (IPV) and homicides in Mexico. The first chapter examines the effect of a woman's relative income on IPV. My results show a U-shaped relationship between a woman's relative income and the prevalence of physical, emotional and economic IPV. In contrast, sexual IPV linearly increases with a woman's relative income. In the second chapter, I investigate the impact of easier access to divorce—as a consequence of the introduction of unilateral and no-fault divorce—on IPV and a woman's contribution to decision-making. The results show that emotional and economic IPV decrease, while physical and sexual IPV increase when they are not associated with the two other types of violence. Moreover, a woman's contribution to decision-making improves as divorce becomes easier. In the third chapter I examine the role of the electoral cycle in explaining turf wars between Drug Trafficking Organisations (DTOs). Using homicides between DTOs as a proxy for turf wars, my findings show an increase in homicides during the lame duck period.

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Chapter 1

Introduction

This thesis covers areas of development economics, family economics, and economics of crime. It contributes to the understanding of the risk and protective factors for IPV, as well as the causes of the dramatic increase in violence in Mexico during the last decade.

IPV is one of the cruellest violations of human rights, affecting one in three women worldwide. In Mexico, about 46% of women have experienced it at some point during their current or past relationship[1]. Studying IPV is important not only because it is highly prevalent but also because it represents a serious obstacle to women's empowerment and achieving inclusive growth. In this thesis I examine whether IPV is affected by a woman's relative income and easier access to divorce. By analysing these two factors one can shed some light on potential policies to prevent and reduce violence. The third chapter moves beyond IPV to investigate other types of violence. In particular, I analyse the role of the electoral cycle in explaining homicides in Mexico.

In the first chapter, I study the effect of a woman's relative income (i.e. the share of her income over the couple's total income) on the prevalence of physical, sexual, emotional and economic IPV. The main contribution is to analyse whether this effect is non-monotonic. To account for the potential endogeneity of a woman's relative income I construct an instrument based on the industry composition of the state and the industry-specific income changes at the national level. My results show a significant U-shaped relationship between a woman's relative income and the probability of physical, emotional and economic IPV with turning points just below the middle of the relative income distribution. I also find that the probability of sexual IPV linearly increases with a woman's relative income. These findings suggest that IPV would not necessarily decrease as the woman's relative economic position improves in the household, contrary to the classical prediction of divorce threat models.

The second chapter examines the effect of easier access to divorce on the prevalence of physical, sexual, emotional and economic IPV. This is the first paper to study this research question in the context of a developing country. I do so by exploiting the state-level

[1]Data obtained from ENDIREH *(Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares)* [National Survey on the Dynamics of the Relationship within the Households].

variation in the timing of the introduction of unilateral and no-fault divorce in Mexico. The results indicate a significant decrease in sexual, emotional and economic IPV, which is driven by couples who continue to remain married after the reform. This decline, however, only holds when these types of IPV are not associated with physical violence. The results also show a significant increase in physical and sexual IPV occurring alone or with no associated emotional and/or economic violence. Taken together, these findings suggest a substitution effect across forms of IPV, which is at variance with the prediction of divorce threat models. These findings stand in sharp contrast to those obtained in developed countries, which highlights the importance of considering the specific context of the country when designing policies for preventing IPV. As part of this paper I also study the impact of easier divorce on the woman's decision-making power. My results indicate that the woman's absolute and relative decision-making power has increased in reform, as compared to non-reform, states following the reduction in the cost of divorce. However, this improvement has been limited, since it is concentrated on the decisions usually made by them.

In the final chapter I investigate whether turf wars between DTOs for the control of strategic territories are higher during the lame duck period, when incumbent DTOs might be relatively weaker—because of the breakdown of the *status quo*. Using homicides as a proxy for turf wars, my results show support for this hypothesis. In particular, I find an increase in killings between DTOs in the lame duck period, as compared to other periods, in municipalities valuable for DTOs. This increase is concentrated on municipalities in which the PRI[2]—the largest political party of Mexico—wins the election. In contrast, those in which the PAN[3]—conservative party which has always been the party of the federal government during my period of analysis— wins experience a decrease in homicides.

[2] *Partido Revolucionario Institucional* (Institutional Revolutionary Party).
[3] *Partido de Acción Nacional* (National Action Party).

Chapter 2

Woman's relative income and intimate partner violence in Mexico: A non-monotonic relationship

2.1 Introduction

Intimate partner violence (IPV)[1] is the most common form of abuse against women. It is estimated that around one third of women worldwide experience it, which is not limited to any particular country, culture or social class. IPV has also been shown to negatively affect women's labour market and health outcomes[2], as well as have adverse consequences on their children (Aizer, 2011; Devries et al., 2013; Pollak, 2004; Tolman and Wang, 2005). In addition, IPV represents a large economic cost for society in terms of services, human and emotional costs, and loss of economic output (Walby, 2009).

All these reasons make IPV a serious public health problem, as well as a violation of human rights, which constitute an obstacle to women's empowerment and overall human development (Agarwal and Panda, 2007). Consequently, it is crucial to understand the determinants of IPV, as well as the nature of the relationship, which will help to design effective policies. This paper specifically identifies the effect of a woman's relative income[3] on the prevalence of physical, sexual, emotional and economic IPV in Mexico. Although previous research has provided some insights in this area, it still presents several limitations.

The most important limitation refers to the usually assumed linear relationship between a woman's relative income and IPV[4]. In the context of developing countries, however, men might react differently to women's economic empowerment depending on whether her income is below or above his. The reason lies on the importance of traditional gender roles. For instance, a man might feel his dominant position threatened as his partner's income approaches or exceeds his, which could trigger IPV, but not otherwise (Angelucci, 2008; Bertrand et al., 2015). Thus, the main contribution of this paper

[1] I use IPV, violence and abuse interchangeably.

[2] In my sample, 18% report physical injuries and 64% mental health problems as a consequence of experiencing violence. Moreover, 6% have stopped working or lost money or possessions.

[3] Income refers to labour income. See Data Appendix for details.

[4] See, for instance, Aizer (2010). Exceptions include the theoretical work by Anderberg and Rainer (2013) using women's potential relative wage, and the empirical works by Angelucci (2008) and Farmer and Tiefenthaler (1997) employing absolute measures of actual income. These papers will be discussed in the next section.

is to examine whether the relationship between a woman's relative income and IPV is non-monotonic.

A second contribution is the use of a relative measure of woman's economic status: the share of her income over the couple's total income. Household bargaining models, as well as sociological theories, suggest that it is not the absolute income, but the difference between the partners' incomes that matters in explaining IPV (Aizer, 2010; Atkinson et al., 2005). In spite of this, previous studies in developing countries have primarily looked at absolute measures of income or employment[5]. A final contribution refers to the analysis of four different types of IPV. Previous research has mainly focused on physical and, to a lesser extent, sexual IPV, even when emotional and economic abuse are significantly more common and can have longer-lasting consequences (Kelly and Johnson, 2008; Mechanic et al., 2008).

In order to examine the relationship between a woman's relative income and IPV in Mexico, I use data from three independent cross-sectional samples of a nationally representative survey called ENDIREH[6], which were conducted in 2003, 2006 and 2011. This survey captures information on male-to-female IPV, as well as a rich set of partner, couple and household characteristics. My final sample is comprised of 136,818 married or cohabiting women aged 15-64 residing with their partners.

To account for the potential endogeneity of a woman's relative income, I use an instrumental variable (IV) approach and estimate the model by Two-Stage Least Squares (2SLS). The instrument is based on a modification of the index of labour demand originally proposed by Bartik (1991) and extensively used in the labour literature. It specifically exploits the initial industry composition of the state and the industry-specific income changes at the national level.

The results indicate that the relationship between a woman's relative income and IPV needs not be linear. Specifically, I find robust evidence for a U-shaped effect of a

[5]See Cools and Kotsadam (2017) for an exception.

[6]*Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares* (National Survey on the Dynamics of the Relationship within the Households).

woman's relative income on the probability of physical, emotional and economic IPV. As the woman's relative income increases, the probability of IPV decreases up to a certain threshold of the relative income distribution, which I find to be 0.31 or 0.44 for the three types of violence, depending on whether I control for the extremes of the relative income distribution. Beyond this point, an improvement in the woman's relative income increases the probability of IPV. 20.9% of women have a relative income greater than 0.44, which suggests that the increase in IPV is likely to affect a non-negligible number of them.

The U-shaped pattern is consistent with an explanation by which, as the woman's relative income increases, IPV declines through an improvement in her relative bargaining power. This is the classical prediction of divorce threat models. However, as the woman's income approaches her partner's, this could be perceived by him as a threat to his dominant position, which increases the probability that he uses IPV in order to restore his power and reassert his dominance, which would be in line with a male backlash explanation.

Regarding sexual IPV, I find no support for a non-monotonic relationship. Instead, the estimates show a significant increase in the probability of this type of abuse as the woman's relative income improves, which is consistent with a 'male backlash effect' hypothesis.

The rest of the paper is organised as follows. Section 2.2 reviews previous theoretical and empirical literature on the relationship between a woman's economic status and IPV. Building on this, section 2.3 specifically brings in gender norms and examines how they shape the probability that men inflict IPV. Section 2.4 presents the identification strategy, while section 2.5 describes the data. Section 2.6 reports the results and conducts some robustness checks. Section 2.7 concludes and discusses the limitations and implications of the study.

2.2 Related literature

Theoretical work

Economists have primarily examined IPV using non-cooperative household bargaining models in which the threat point is determined by the utility each partner would obtain outside the marriage. These models can be classified into two broad categories. The first one considers that some males have a direct taste for violence and both partners bargain over IPV and consumption. Assuming that a woman's reservation utility is binding in equilibrium, their crucial prediction is that, an increase in the woman's relative income, improves her outside options, which raises her bargaining power and decreases IPV (Aizer, 2010; Farmer and Tiefenthaler, 1997; Tauchen et al., 1991)[7].

A second body of the literature has modeled violence as an instrument to extract additional resources from the woman (Bloch and Rao, 2002; Bobonis et al., 2013) or to enhance the man's control over the allocation of resources (Anderberg and Rainer, 2013; Eswaran and Malhotra, 2011). In the dowry context in India, Bloch and Rao (2002) develop a model in which the husband has private information over his gains to the marriage. He uses IPV to signal his dissatisfaction with the marriage and extract additional rents from the wife's family. Bobonis et al. (2013) adapts this model to the context of Mexico's conditional cash transfer (CCT) programme *Oportunidades*. They predict that men with low private gains to marriage might use threats of violence with no associated physical IPV in order to coercively demand transfers from their partner. This is accompanied by a decline in the probability of physical IPV, which would only be used strategically if she does not comply with the demand.

Eswaran and Malhotra (2011) consider IPV as an instrument used by the husband to ensure that his wife allocates resources in accordance with his preferences. They show

[7]When the woman's reservation utility is not binding, violence can have both an expressive and an instrumental motive, and IPV can either increase or decrease as her reservation utility improves. Expressive violence refers to violence being used as a release of frustration or anger, or as a direct source of gratification; whereas instrumental violence is used to exert control over the woman's behaviour or resources (Heath, 2014; Kimmel, 2002; Tauchen et al., 1991).

that an improvement in the wife's reservation utility could be accompanied by an increase in the probability of IPV in equilibrium. This would occur if she is willing to tolerate greater violence in exchange for imposing her preferences to a larger extent.

Moving beyond a monotonic relationship, Anderberg and Rainer (2013) posit an inverted U-shaped association between a woman's potential relative wage and economic IPV. Their prediction is that, when her relative wage is at the bottom of the distribution, her partner makes monetary transfers to her in exchange for her voluntary specialisation in domestic work. This coincides with his desired outcome and, therefore, there is no need to use IPV. As her relative wage increases, she enters the labour market, which goes against his desired outcome. He tries to persuade her to stay at home through monetary transfers and eventually direct sabotage of her employment opportunities. However, the incentives for using economic IPV vanish as her relative wage approaches the top of the distribution, since her earnings become very important for the household.

In addition to economic theory, the relationship between a woman's economic status and IPV has long been of interest in the sociological literature. Relevant for this paper is relative resource theory (Allen and Straus, 1980; Anderson, 1997; Cools and Kotsadam, 2017). It posits that violence is an ultimate resource available for the man to restore power if he perceives that there is an imbalance in access to resources (e.g. education, income, status) to his detriment. Atkinson et al. (2005) expand this theory to include the man's gender ideology. They argue that traditional men link economic status to masculinity. Consequently, when masculinity cannot be validated through economic status, they might resort to violence. Conversely, egalitarian men are not expected to do so.

As Atkinson et al. (2005) point out, the use of IPV might not only respond to a discrepancy in access to resources, but also to a challenge to masculine identity. In this regard, if an increase in the woman's relative income is perceived as a threat by the man to his culturally prescribed dominant position, he might use IPV in order to reassert his dominance (Chin, 2012; Connell, 2005). This is what is known as a 'male backlash effect', which is a term used previously by economists.

Empirical findings

In the empirical domain, evidence remains inconclusive regarding the sign, direction and magnitude of the relationship between a woman's economic status and IPV. Broadly speaking, most studies in developed countries (mainly United States) find a negative association, regardless of whether endogeneity is taken into account. These studies have looked at woman's employment status (Gibson-Davis et al., 2005), the gender wage gap (Aizer, 2010), the gender-profile unemployment rate, (Anderberg et al., 2015)[8] and the introduction of unilateral divorce laws (Brassiolo, 2016; Stevenson and Wolfers, 2006). Interestingly, Aizer (2010) finds that, as the female-to-male wage ratio increases, domestic violence declines. Her findings are consistent with the classical prediction of household bargaining models and not with a 'male backlash effect' hypothesis. She, however, assumes a linear relationship, which might hide heterogeneous impacts along the wage ratio distribution.

In the context of developing countries, more disagreement persists. In India, Eswaran and Malhotra (2011) find a positive relationship between being working for pay and the probability of physical IPV[9], while Panda and Agarwal (2005) find a negative association between a woman's possession of assets and physical and psychological violence. These studies, however, fail to account for the endogeneity of a woman's economic status. Chin (2012) overcomes this limitation using an IV approach[10]. Her results show a decreasing effect of working for pay on the probability of physical IPV. Employing female income and a similar methodology, Luke and Munshi (2011) reach opposite results. Specifically, they find that, among the 'former slave castes', an increase in the woman's income, conditional on the total household income, raises the probability of IPV.

Research using Mexican data flourished with the publication of the first wave of two

[8] Anderberg et al. (2015) develop a dynamic game of incomplete information in which the husband can be of two types: have a violent predisposition or be averse towards violence. Whether he reveals which type he is depends on his and her unemployment risk.

[9] This is confirmed by Heath (2014) for a sample of 60 villages in Bangladesh and by Alesina et al. (2016a) for a sample of 18 countries in Africa.

[10] She exploits the regional variation in the impact of rainfall shocks on female labour demand in rural areas.

nationally representative surveys on IPV in 2003, ENDIREH being one of them. Employing the first wave of this survey, Frías and Angel (2012) estimate several logistic regressions on a sample of families with low Socio-Economic Status (SES). They find an insignificant association between a woman's employment status and the risk of physical abuse. Analysing heterogeneous effects by age, Castro et al. (2008) find that women working for pay in the age group of 30-34 are more likely to experience physical violence, while they find no significant association for those in the age ranges of 15-21 and 45-49. In contrast, taking endogeneity into account, Villarreal (2007) shows a decreasing effect of working for pay on the probability of physical IPV[11].

Another strand of the Mexican empirical literature has examined the impact of *Oportunidades* on IPV. Bobonis et al. (2013) find support for their model, that is, beneficiary women are less likely to be victims of physical violence, but more likely to experience threats of violence with no associated physical abuse, as compared to non-beneficiary ones, which is consistent with a motive for rent extraction. In a related paper, Angelucci (2008) exploits the initial random implementation of the programme in rural villages to examine its impact on drunken violence. She finds different results depending on the magnitude of the income transfer. Violence falls for households entitled to small transfers, regardless of the husband's educational level. Conversely, for households entitled to large transfers, the sign of the effect depends on his educational level: it decreases for more educated men, while it rises for less educated ones. She suggests that men with low education might hold traditional gender beliefs and, consequently, they might perceive income transfers targeted at women as a threat to their dominant position.

Angelucci (2008)'s findings question the usually assumed linear relationship between a woman's income and IPV. Support for non-monotonicity has also been found by Farmer and Tiefenthaler (1997) using two small samples in Nebraska and North Carolina. These samples are, however, not random and their estimates are likely to suffer from endogeneity.

[11]He estimates a multivariate probit model of two simultaneous equations (physical IPV and employment). He uses three instruments for employment (financial help from relatives, woman's work orientation and number of pre-school children living with her) and IPV (violence in the husband's childhood, length of current relationship and number of residents per room).

2.3 The Mexican context

Relative income, IPV and gender norms in Mexico

The literature review has stressed the importance of taking into account the particular context of the country under study. While in developed countries a theoretical model predicting a decrease in IPV following an improvement in the woman's relative income might be suitable, it is not clear whether this is the case for developing countries. The reason lies on the importance of gender norms, which are likely to influence the man's probability of inflicting violence[12].

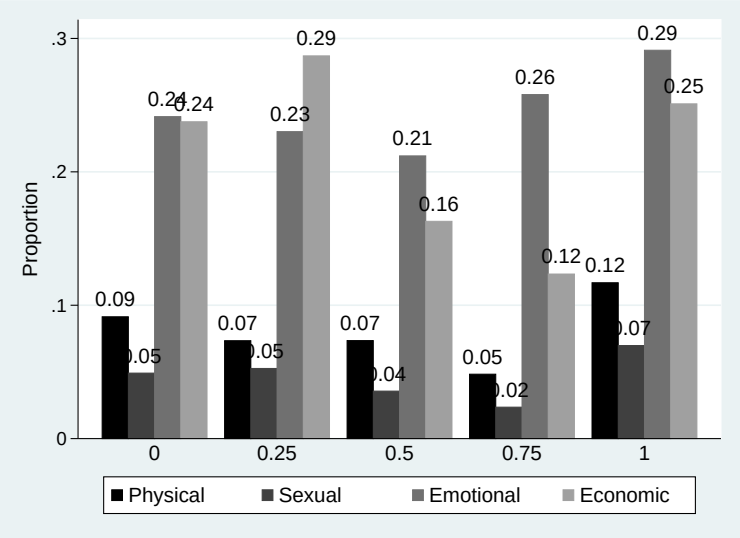
Maldonado et al. (2005) conduct group interviews on partners of women beneficiary of *Oportunidades* in three rural communities of Mexico. The interviews revealed that, in general, men think that they have to be the breadwinners, which they associate with masculinity. When they do not fulfill this role, they feel threatened, since it questions their culturally prescribed dominant position in the household, as well as gives women economic freedom, which they can use to 'rebel' against male authority. Some men also think that they need to be the decision makers over major decisions and exert control over their partners. Indeed, the use of IPV tends to be associated with the way in which power between partners is distributed[13].

This evidence suggests that a man might feel his dominant position threatened as his partner's relative income improves, which could ultimately trigger IPV. This might depend, however, on the point of the relative income distribution in which the woman is at. Figure 2.1 depicts the prevalence of IPV for five values of a woman's relative income. Although this figure might be capturing the effect of a number of other factors, overall it suggests a U-shaped relationship. In the next sections, I empirically examine whether

[12]Gender norms are also likely to influence the woman's probability of working for pay, as well as her income Bertrand et al. (2015). In this paper, however, I take income as given and, thus, whether it is affected by gender norms is irrelevant.

[13]Although the interviews are specific of men with limited resources living in rural communities, their findings are also relevant for other groups of men across Mexico, as previous studies have shown (Agoff et al., 2006; Frias, 2010; Galanti, 2003).

Figure 2.1: Prevalence of IPV by women's relative income



Notes: The horizontal axis refers to five values of the woman's relative income and the vertical axis to the proportion of women experiencing each type of IPV. *Source:* ENDIREH.

the relationship between a woman's relative income and IPV is, indeed, non-monotonic.

Actual or potential relative income?

In the context of IPV, most household bargaining models consider divorce as the relevant threat scenario. If this is the appropriate threat point, a woman's bargaining power, and consequently IPV, will not be determined by her actual relative income, but her potential one. The reason is that working hours (and, thus, earnings) at the equilibrium might differ from working hours at the threat point[14] (Aizer, 2010; Majlesi, 2016; Pollak, 2005). Following this reasoning, I should be using a measure of a woman's potential relative income, as done in Aizer (2010). However, there are at least two reasons supporting my choice of her actual relative income instead.

First, although divorce is allowed in Mexico, the credibility of it might be low in some circumstances. For instance, if the breakdown of the bargaining process between spouses arises over minor decisions, they are unlikely to divorce. In this context, the threat point might be better represented as a non-cooperative outcome within marriage. This implies that changes in the partners' outside options will have no impact on the intra-

[14]For instance, a woman who does not work for pay while married, might do so upon divorce.

household distribution of power (Anderson and Eswaran, 2009; Lundberg and Pollak, 1993). Moreover, as Majlesi (2016) points out, if a woman's actual earnings reflect her experience and this experience affects her potential earnings, then a woman's bargaining power would be affected by her current earnings. Furthermore, although divorce rates have increased over time in Mexico, they continue to be low compared to developed countries, as well as those of a similar level of development, which is especially the case in rural areas (Ojeda and González Fagoaga, 2008)[15]. Taken together, this implies that the threat scenario is not always likely to be represented by divorce, which suggests that examining the effect of a woman's actual relative income on IPV can also provide interesting insights into understanding the determinants of violence.

Second, sociological theories have long stressed that a woman's economic status affects bargaining power and IPV. Thus, even if divorce threat models predict that changes in the woman's actual relative income will have no impact on her bargaining position, sociologists predict the opposite (Anderson, 1997; Atkinson et al., 2005). Moreover, empirical evidence from Mexico has found that a woman's actual economic status affects her bargaining power in the household, and that both factors might threaten her partner's dominant position (Antman, 2014; Maldonado et al., 2005). In short, sociological theories, as well as empirical evidence from Mexico, suggest that the intra-household distribution of power might not only respond to outside options, but also to actual incomes.

2.4 Identification strategy

In order to examine the effect of a woman's relative income on IPV, I pool the three survey years and estimate the following Linear Probability Model (LPM):

$$IPV_{ist} = \beta_0 + \delta_1 RI_{ist} + \delta_2 RI_{ist}^2 + \beta_1 X_{ist} + \alpha_s + \gamma_t + \varepsilon_{ist} \tag{2.1}$$

[15]In Mexico, the annul number of divorces per 1,000 inhabitants was 0.7 in 2005, which was below the average value for the Latin America region during this period (around 1.0) (UN, 2010).

where i refers to woman, s to state and t to survey year. IPV_{ist} is an indicator of whether the woman has experienced IPV in the last 12 months. RI_{ist} is woman's relative income and RI^2_{ist} the square of it. Thus, δ_1 and δ_2 are the parameters of interest. X_{ist} includes a vector of observable time-varying characteristics at the individual, couple and household level[16]. α_s are state fixed effects for woman's state of residence. They control for time-invariant unobserved factors that vary across states including historical and cultural factors, as well as access to health clinics, shelters and the criminal justice system. γ_t are year fixed effects, which capture, for instance, changes in national-wide policies (e.g. the General Law on Women's Access to a Life Free of Violence of 2007 or the Judicial Reform of 2008), as well as in reporting practices influenced by aggregate trends in the business cycle or by views on gender roles. ε_{ist} is the error term. I cluster the standard errors at the state level to account for intra-cluster correlation[17].

The parametric approach of including the first and second-order terms has been the most common method to test for non-monotonicity (Kostyshak, 2015). However, as Lind and Mehlum (2010) argue, several studies have inadequately concluded that there is a non-monotonic relationship by only checking that the sign and significance of the two terms is as expected (in some cases the first term is even not included) and that the turning point lies within the range of possible values[18]. These two aspects are necessary, but not sufficient, since this shape can also be reached if the relationship is non-linear, but monotonic (e.g. exponential). This would occur if the turning point is close to the limit of the range of values.

Given these limitations, Lind and Mehlum (2010) propose a test for the presence of a

[16]Both partners' age (continuous and five categories), both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index and an indicator of whether more than one woman was interviewed in the household (see details in the Data Appendix).

[17]The number of states is 32, which is below the usually accepted number of clusters to produce accurate standard errors. In these cases, Cameron et al. (2008) suggest using Wild cluster bootstrap-t procedures. Following this suggestion, I test for whether the coefficients of interest are statistically equal to zero both individually and jointly using this approach. In all cases, conclusion are the same as those presented in section 2.6.

[18]See, for example, Aghion et al. (2005) and Sigman (2002).

U shape, which is based on the general framework developed by Sasabuchi (1980)[19]. It specifically tests the combined null hypothesis that the relationship is increasing at low values of the woman's relative income and/or decreasing at high values (i.e. it is monotone or has an inverse U shape) against the alternative that it is decreasing at low values of the woman's relative income and increasing at high values (i.e. it has a U shape). This test provides the necessary and sufficient conditions for the existence of a U shape, and will be used when presenting the results.

The main concern in estimating equation 2.1 is the potential endogeneity of a woman's relative income. This concern is mitigated by the inclusion of a wide range of time-varying covariates, as well as state fixed effects. Even though, there can still be unobserved factors that are correlated with a woman's relative income and that affect the prevalence of IPV, such as health condition, as well as consumption of alcohol and drugs. Previous studies have found that individuals with poorer health have lower earnings (Pelkowski and Berger, 2004), whereas those who consume alcohol have higher earnings (Bray, 2005). At the same time, previous literature also suggests that women with health-related problems (Hughes et al., 2012) and those who consume alcohol (and/or her partner does) (Angelucci, 2008; Luca et al., 2015) are more likely to experience IPV. Consequently, one would expect these variables to potentially confound the estimates of interest.

A second source of endogeneity refers to the potential reverse causality of IPV on the woman's relative income. Previous studies have shown that women who suffer from IPV are more likely to be unemployed, work less hours and have mental health problems, which is likely to lower their relative income. Even when they do not experience IPV, they could decide not to work in the first instance, not to accept promotions at work, obtain a lower paid job or even stop working if they think that their partner could eventually inflict violence on them (Lloyd, 1997; Tolman and Wang, 2005; WHO, 2012).

In order to deal with these threats to identification, I use an IV approach and estimate the model using 2SLS. The instrument is based on a modification of the index of labour

[19]Implemented in Stata by the command *utest*. This test has been increasingly used in the empirical literature (see, for instance, Samargandi et al. (2015)).

demand initially proposed by Bartik (1991) and extensively used in the labour literature[20]. This approach exploits the fact that women and men in Mexico have historically worked in different industries. For instance, 97% of workers in the construction industry are males, whereas 63% of those working in social services (i.e. education, health, social care) are females. The instrument is then constructed as a weighted sum of the female (male) industry-specific average annual income at the national level, where the weights are the female (male) industry shares in the state in the baseline year. This predicted measure of income isolates the gender-specific change in local income that is driven by aggregate labour demand shocks, which is likely to be unrelated with workers' characteristics.

More specifically, the instrument is calculated by gender, educational level and age group as follows:

$$\hat{I}^{g,e,a}_{s,t} = \sum_{j} \gamma^{g,e,a}_{j,s,2003} \times I^{g,e,a}_{j,-s,t} \tag{2.2}$$

where $\gamma^{g,e,a}_{j,s,2003}$ is the proportion of workers in industry j[21] in state s in the baseline year 2003 of a given gender g, educational level e and age group a. By using a baseline year, I ensure that changes in income over time do not reflect workers' selective sorting into industries. $I^{g,e,a}_{j,-s,t}$ is the national average annual income for industry j in year t for a given gender, educational level and age group, excluding the state in question. The focal state is excluded in order to avoid that industry-specific changes at the national level reflect changes in the workers' characteristics of the state. For constructing the instrument, t does not refer to the calendar year, but to the fourth quarter of the year before the ENDIREH survey and the first three quarters of the ENDIREH survey year. By defining the instrument during this time span I more closely match it to the 12 months period to which the IPV questions refer[22].

[20] See Aizer (2010) and Anderberg et al. (2015) for examples in the context of IPV.

[21] I define ten industries, which are a condensed version of the North American Industry Classification System (NAICS): agriculture, livestock farming, forestry, fishing and hunting; energy (i.e. mining and utilities); manufacturing; construction; trade; food and accommodation services; transportation, warehousing and information; professional, corporate and financial services; social services (i.e. education, health and social care); other (e.g. cultural and sports) services; and public administration.

[22] The IPV questions refer to between October of the year before the survey and the interview date, which was between October and November (see section 4.4 for more details).

The predicted income of gender g is positively and significantly correlated with the actual income of gender g (see columns 1 and 2 of table A4 in the Appendix[23]). The intuition behind this relationship is that states that initially had a larger proportion of female (male) workers in industries that have experienced positive shocks in female (male) income at the national level, report larger increases in the actual female (male) income.

I use these individual predicted incomes to construct an instrument for the woman's actual relative income (defined in the next section), which is expressed as $\hat{RI} = \frac{\hat{I^w}}{\hat{I^w}+\hat{I^m}}$. Columns 3-5 of table A4 directly test for the strength of the relationship between women's relative income and the instrument. Specification 3 expresses income in natural logarithms, while specifications 4 and 5 in levels. Throughout the paper income will be measured in levels[24], but the results are not sensitive to the functional form used[25]. In addition, column 5 controls for whether the woman's relative income lies on the extremes of the distribution. In the three cases, I find that the predicted relative income is significantly positively correlated with the actual relative income at the 1% level. In order to estimate equation 2.1, I use this IV and the square of it, i.e. the equation is exactly identified. When I control for the full set of covariates, the joint F statistic[26] value is 25.38, which suggests no weak instrument-related problem.

2.5 Data and descriptive statistics

The main source of data is ENDIREH, which is a nationally representative survey conducted in 2003, 2006 and 2011. The target population in 2003 were married or cohabiting women aged 15 or older residing with their partners, whereas it was extended in 2006 and 2011 to include all women 15 or older regardless of their marital status and whether they were residing with their partners. In this paper, I restrict my sample to married or

[23]For easier interpretation, actual and predicted incomes in columns 1 and 2 are defined in natural logarithms, but results hold if I define income in levels.

[24]The reason is that the measure of woman's actual relative income is constructed using income in levels.

[25]This will be examined in section 2.6.

[26]Refers to the Kleibergen-Paap rk Wald F statistic.

cohabiting[27] women aged 15-64 residing with their partners. Data were collected through direct interviews conducted between 20th October and 14th November of 2003, 9th October and 3rd November of 2006, and 3rd October and 11th November of 2011.

Given the multidimensionality of IPV, the survey contains information on 29 violent items[28] that capture four types of abuse: physical, sexual, emotional and economic. Table A3 in the Appendix presents the complete list of them and their prevalence rate in 2003, 2006 and 2011. Following previous literature, as well as the classification provided by ENDIREH, I group these violent items into four categories of violence, namely physical[29], sexual, emotional and economic IPV[30]. I construct a dependent variable for each of these four types of IPV, which is defined as a dichotomous variable equal to one if the woman has experienced any violent item in the 12 months previous to when the survey was conducted and zero otherwise[31].

One of the common problems of self-reported measures of IPV is that they are likely to be under-reported (Ellsberg et al., 2001). This concern is likely to be reduced in my survey due to several reasons. First, ENDIREH interviews were conducted by trained women, who stress the confidentiality of the responses. Second, interviews were conducted in private with the woman alone, who was guaranteed confidentiality. This reduces the pressure from the presence of other members. Third, the questionnaire asks multiple questions for each of the four types of abuse, which provides the woman multiple opportunities for disclosing IPV.

Panel A of table 2.1 reports the mean value of each type of IPV in my sample. Overall, 8.7% of women have experienced physical, 4.6% sexual, 23.8% emotional and 22.0%

[27]This excludes divorced, separated, widowed and single women, as well as those in a relationship not residing with their partners. There are several reasons for this. First, I am interested in within couple dynamics. Second, there is no information about them in 2003, as well as about their partners' characteristics including income in 2006 and 2011. Third, the questions related to IPV are not comparable (e.g. different questions are asked and the time reference considered in them is different).

[28]There are 30 violent items in 2006 and 2011.

[29]Includes both physical IPV and serious threats. This has been a common approach in previous studies (see, for instance, La Mattina (2017) and Stevenson and Wolfers (2006).

[30]I exclude from my analysis the violent event 'has your partner stopped talking to you?', since this question can be interpreted with a large degree of subjectivity.

[31]The correlation between types of IPV ranges from 0.3 (between sexual and economic) to 0.5 (between emotional and economic).

Table 2.1: Descriptive statistics

	All	2003	2006	2011
Panel A: IPV				
Physical IPV	0.087	0.090	0.104	0.069
Sexual IPV	0.046	0.069	0.056	0.030
Emotional IPV	0.238	0.255	0.240	0.230
Economic IPV	0.220	0.274	0.229	0.192
Panel B: Woman's relative income				
Woman's relative income	0.187	0.185	0.177	0.198
Panel C: Covariates				
Age woman	36.950	35.773	37.110	37.200
Age man	39.827	38.757	40.011	40.017
Age woman 15-24	0.129	0.134	0.115	0.140
Age woman 25-34	0.307	0.352	0.311	0.287
Age woman 35-44	0.312	0.311	0.326	0.300
Age woman 45-54	0.192	0.159	0.191	0.203
Age woman 55-64	0.060	0.044	0.057	0.069
Age man 15-24	0.077	0.078	0.067	0.087
Age man 25-34	0.270	0.310	0.268	0.258
Age man 35-44	0.314	0.319	0.326	0.299
Age man 45-54	0.226	0.202	0.228	0.232
Age man 55-64	0.114	0.091	0.110	0.125
Indigenous woman	0.065	0.093	0.062	0.059
Indigenous man	0.069	0.099	0.066	0.062
<Primary education woman	0.049	0.064	0.055	0.039
Primary education woman	0.318	0.385	0.327	0.286
Secondary education woman	0.278	0.241	0.266	0.303
Middle-Higher education woman	0.355	0.310	0.352	0.372
<Primary education man	0.046	0.059	0.049	0.038
Primary education man	0.304	0.353	0.306	0.284
Secondary education man	0.279	0.252	0.270	0.298
Middle-Higher education man	0.371	0.336	0.375	0.379
Violence in childhood	0.382	0.132	0.420	0.431
Couple's total income (ln)	8.504	7.500	8.766	8.593
Marital status	0.761	0.809	0.780	0.726
Length relationship	15.530	14.668	15.712	15.649
Number of young children	0.419	0.580	0.504	0.279
Extended family	0.924	0.936	0.924	0.919
Location	0.816	0.812	0.834	0.800
SES low	0.413	0.488	0.383	0.416
SES middle	0.398	0.353	0.407	0.406
SES high	0.189	0.160	0.210	0.178
>1 woman interviewed	0.048	0.000	0.000	0.111
Observations	136,818	20,327	57,672	58,819

economic violence. The prevalence of sexual, emotional and economic IPV has declined over time, while that of physical IPV experienced a slight increase between 2003 and 2006, followed by a decrease after.

The explanatory variable of interest is woman's relative income, which is measured as the share of woman's income over the couple's total income[32]. This measure excludes observations in which none of the partners earns income, since I am interested in how they react to income differences between them[33]. Panel B of table 2.1 reports its mean value, which shows that, on average, women's income represents 18.7% of the couple's total income. I next split the relative income distribution into five bands. Table 2.2 shows that it is positively skewed, since around 59% of women do not work for pay. Thus, one question would be whether the instrument is capable of predicting women's labour force participation. I find support for this with an estimated coefficient of 0.087 and a standard error of 0.021. Even so, one might be worried that my results will be driven by the bottom extreme. Section 2.6 will show that this is not the case.

Table 2.2: Distribution of women's relative income

	2003		2006		2011	
Woman's relative income	N	%	N	%	N	%
0	12,529	61.64	35,167	60.98	33,068	56.22
(0-0.5)	4,363	21.46	13,450	23.32	15,206	25.85
0.5	1,022	5.03	3,783	6.56	4,282	7.28
(0.5-1)	1,355	6.67	3,621	6.28	4,033	6.86
1	1,058	5.2	1,651	2.86	2,230	3.79
Total	20,327	100	57,672	100	58,819	100

Notes: 'N' refers to the number of observations and '%' to the number of women within each range of the relative income distribution as a percentage of the total number of women. *Source:* ENDIREH.

Furthermore, figure 2.2 depicts the woman's relative income distribution excluding the extremes. As can be seen, there is a peak in the middle of the distribution[34], which occurs

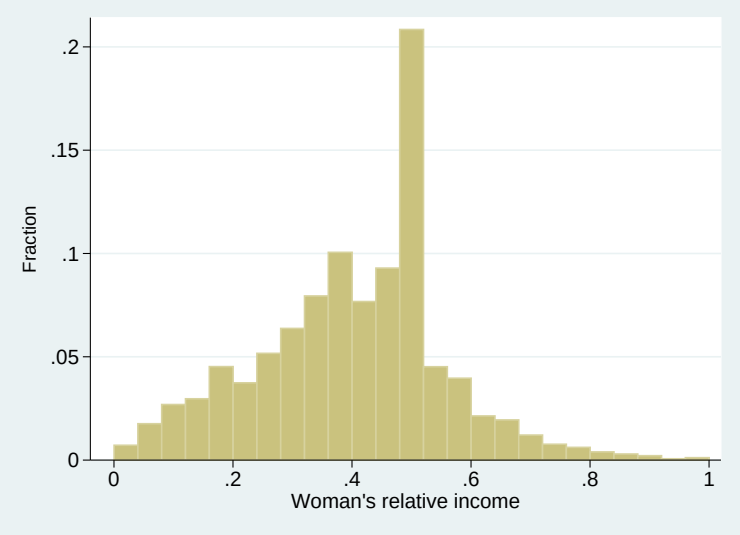
[32]A higher relative income does not necessarily mean that the woman earns more income, but it can be that the man earns less (or both). Whether the reason for a change in the woman's relative income is one or the other, does not affect the motivation for IPV, since the man is expected to respond to her relative income, regardless of the source of the change.

[33]Following this argument, I should also remove couples where both partners earn the same income. However, I include them, since a man might react to a relative income equal to 0.5 given that his partner is near to exceed his income. As a robustness check, I will exclude this group.

[34]This bin includes a relative income between 0.48 and 0.52, but the peak is entirely driven by a relative

in the three years. A possible reason for this peak could be related to the misreporting of incomes. In particular, the income question is answered by the target woman in 2003 and 2006, and by any member of the household aged 15 or older who knows about the sociodemographic and economic characteristics of all the household members in 2011. Consequently, it could be that if the respondent does not know the exact income of the woman and/or her parter, she reports the same amount for both. In order to further examine this, section 2.6 will present several robustness checks.

Figure 2.2: Distribution of woman's relative income



Notes: The height of each bin (25 in total) represents the proportion of women with that specific relative income. The extreme values zero and one are excluded.

ENDIREH also contains information on a rich set of variables at the individual, couple and household level, which I employ to construct the covariates. The mean value of all the covariates is reported in panel C of table 2.1. Women in my sample are, on average, 37 years old, while their partners are 40. Only 6% of women and men have an indigenous background. The education distribution is very similar between women and their partners. Only 5% of them have not completed primary education; 32% of women (30% of men) have finished primary education, while 35% (37%) have completed middle or higher education. 38% of women report having experienced violence in childhood. 76% of the couples are married and have been, on average, 15 years together. 81% of the couples live in urban

income equal to 0.5.

areas and 40% have a low SES.

In order to construct my instrument, I employ information from ENE *(Encuesta Nacional de Empleo)* and ENOE *(Encuesta Nacional de Ocupación y Empleo)* [National Labour Force Survey]. ENE was conducted until 2004, while ENOE since then. Both are nationally and state level representative surveys, which were/are conducted quarterly. See further details in the Data Appendix.

2.6 Results

Baseline results

Table 2.3 reports the first and second-order coefficients associated with the woman's relative income. Columns 1-2 present the OLS estimates, whereas columns 3-7 the 2SLS estimates. Specifications 1-2 control for the full set of covariates. Specification 3 only controls for state and year fixed effects, whereas models 4-7 add individual, couple and household level covariates, respectively. In addition, columns 2 and 7 also control for whether the woman's relative income lies in the extremes of the distribution.

The OLS estimates in column 1 show no clear relationship between a woman's relative income and IPV. This is no longer the case when I control for the extremes of the relative income distribution (column 2). Specifically, the first-order coefficient of the woman's relative income is negative, while the second-order positive, and both are statistically significant at conventional levels. Once endogeneity is taken into account, the relationship of interest continues to show a U-shaped pattern, except for the case of sexual IPV after controlling for the full set of covariates. Moreover, the magnitude of the coefficients is similar across specifications 4-6, but it significantly increases after controlling for the extremes.

Table 2.3: Effect of women's relative income on IPV – Main specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS		2SLS				
Panel A: Physical							
Relative income	0.050***	-0.086***	-0.438***	-0.825***	-1.091***	-0.807***	-2.597***
	(0.008)	(0.025)	(0.112)	(0.253)	(0.335)	(0.281)	(0.808)
Relative income sq	-0.015	0.108***	0.543***	1.163***	1.685***	1.303***	2.948***
	(0.009)	(0.029)	(0.170)	(0.195)	(0.330)	(0.274)	(0.741)
Panel B: Sexual							
Relative income	0.045***	-0.064**	-0.332***	-0.027	-0.062	0.032	0.011
	(0.006)	(0.025)	(0.095)	(0.159)	(0.201)	(0.174)	(0.523)
Relative income sq	-0.026***	0.079**	0.462***	0.359**	0.419*	0.303	0.411
	(0.008)	(0.029)	(0.149)	(0.157)	(0.237)	(0.214)	(0.513)
Panel C: Emotional							
Relative income	0.115***	-0.203***	-1.313***	-2.067***	-2.747***	-2.098***	-6.705***
	(0.014)	(0.048)	(0.291)	(0.516)	(0.726)	(0.625)	(1.642)
Relative income sq	-0.078***	0.162***	2.033***	2.976***	4.285***	3.380***	7.629***
	(0.016)	(0.053)	(0.468)	(0.526)	(0.888)	(0.785)	(1.627)
Panel D: Economic							
Relative income	0.010	-0.363***	-1.032***	-2.005***	-2.739***	-2.029***	-6.287***
	(0.016)	(0.042)	(0.228)	(0.503)	(0.665)	(0.558)	(1.477)
Relative income sq	0.006	0.353***	1.646***	2.815***	4.196***	3.221***	7.158***
	(0.016)	(0.050)	(0.369)	(0.460)	(0.803)	(0.687)	(1.366)
State/Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual	Yes	Yes	No	Yes	Yes	Yes	Yes
Couple	Yes	Yes	No	No	Yes	Yes	Yes
Household	Yes	Yes	No	No	No	Yes	Yes
Extremes	No	Yes	No	No	No	No	Yes
F statistic			89.73	25.46	36.32	25.38	72.15
Observations	136,818	136,818	136,818	136,818	136,818	136,818	136,818

Notes: OLS (columns 1-2) and 2SLS (columns 3-7) estimates reported. Robust standard errors clustered at the state level in parentheses. F statistic refers to the Kleibergen-Paap rk Wald F statistic. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. 'Individual' includes both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories) and woman's experience of violence in her childhood. 'Couple' includes couple's total income, marital status, length of the relationship, number of young children and whether the couple lives alone. 'Household' includes urban residence, SES index and whether more than one woman was interviewed in the household. 'Extremes' includes two indicators of whether the woman's relative income is zero and whether it is one.***significant at 1% level, **at 5%, *at 10%.

The first three rows of each panel in table 2.4 report the value, standard error and 95% confidence interval of the turning points; whereas the last row reports the p-value associated with the overall test for the U shape proposed by Lind and Mehlum (2010). Panel A does not control for the extremes of the relative income distribution, whereas

panel B does. Only results for physical, emotional and economic IPV are reported, since sexual IPV does not seem to follow a non-linear relationship. Focusing on panel A, the threshold value is 0.31 for the three types of IPV, which lies within the range of possible values. In panel B, the turning point is 0.44 for the three cases, which is larger and significantly different from that reported in panel A. The last row of each panel indicates that the null hypothesis that the relationship is monotone and/or follows an inverted U shape can be rejected at least at the 1% significance level. In subsequent tables I only present the results controlling for whether the woman's relative income lies in the extremes, but they hold if I do not control for this.

Table 2.4: Effect of women's relative income on IPV – Turning point and U test

	(1)	(2)	(3)
	Physical	Emotional	Economic
Panel A: Not controlling for extremes			
Threshold: Value	0.310	0.310	0.315
Threshold: SE	(0.051)	(0.038)	(0.035)
Threshold: 95% CI	[0.210, 0.410]	[0.236, 0.384]	[0.247, 0.382]
U test: P>|t|	0.002	0.000	0.000
Panel B: Controlling for extremes			
Threshold: Value	0.440	0.439	0.439
Threshold: SE	(0.035)	(0.025)	(0.028)
Threshold: 95% CI	[0.372, 0.509]	[0.391, 0.488]	[0.384, 0.494]
U test: P>|t|	0.001	0.000	0.000

Notes: Standard errors calculated based on the delta method. 'SE' stands for standard error and 'CI' for confidence interval. U test refers to the test for the presence of a U shape proposed by Lind and Mehlum (2010). Panel B controls for whether the woman's relative income lies in the two extremes of the relative income distribution by including two indicators for this.

Table 2.5 presents the marginal effect of a woman's relative income on IPV, as well as the sample mean of IPV, at five representative values of the relative income distribution, namely 0, 0.25, 0.5, 0.75 and 1. As can be seen, when the woman's relative income is equal to zero, an increase of 0.1 in her relative income[35] is expected to decrease the probability of physical abuse by 0.26, while when her relative income is equal to one it is

[35]An increase of 1 is equivalent to moving between the two extremes of the relative income distribution. Thus, 0.1 might be a more plausible number, which is also close to the average value of the woman's relative income in my sample (0.19).

expected to increase it by 0.33. Given that the average value of physical IPV when the woman's relative income is zero and one is 0.08 and 0.11, respectively, these numbers are quite large in economic terms. Furthermore, the increase in IPV is expected to affect a non-negligible number of women, since 20.9% of them have a relative income above the threshold of 0.44. Similar comments can be made for the other two types of abuse.

Table 2.5: Effect of women's relative income on IPV – Marginal effects

	(1)	(2)	(3)	(4)	(5)
	0	0.25	0.5	0.75	1
Panel A: Physical					
Relative income	-2.597***	-1.123**	0.351**	1.825***	3.299***
	(0.808)	(0.449)	(0.159)	(0.351)	(0.704)
Mean of IPV	0.083	0.075	0.071	0.083	0.112
Panel B: Emotional					
Relative income	-6.705***	-2.890***	0.924***	4.739***	8.554***
	(1.642)	(0.861)	(0.333)	(0.896)	(1.679)
Mean of IPV	0.226	0.258	0.200	0.190	0.271
Panel C: Economic					
Relative income	-6.287***	-2.708***	0.872***	4.451***	8.030***
	(1.477)	(0.823)	(0.325)	(0.683)	(1.327)
Mean of IPV	0.218	0.224	0.166	0.226	0.231
Observations	136,818	136,818	136,818	136,818	136,818

Notes: The first row reports marginal effects, while the second the average value of IPV in the sample. Standard errors calculated based on the delta method in parentheses. Columns 1-5 refer to five different values of woman's relative income (0, 0.25, 0.5, 0.75 and 1). The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, state and year fixed effects, and two indicators of whether woman's relative income is zero or one. ***significant at 1% level, **at 5%, *at 10%.

In sum, there is strong evidence in favour of a U-shaped effect of a woman's relative income on the probability of physical, emotional and economic IPV. That is, the probability of IPV declines as the woman's relative income increases up to a turning point, which is below the middle of the relative income distribution, after which it increases[36].

[36]The fact that IPV increases indicates that women are below their threat point.

Regarding sexual IPV, the relationship does not seem to be non-monotonic. I examine other possible patterns below.

Comparing with previous empirical studies, my results are in line with those in Farmer and Tiefenthaler (1997), who report a U-shaped relationship between a woman's absolute non-wage income and the number of physical violence events. My results are, to some extent, also consistent with Angelucci (2008)'s estimates, which show a differential effect of *Oportunidades* on drunken violence depending on the size of the transfer. Conversely, my findings stand in sharp contrast to the theoretical prediction of Anderberg and Rainer (2013) for economic IPV. They propose an inverted U shape, while I find the opposite. One reason could lie in the fact that they focus on a woman's potential, rather than actual, relative income, which might have a different impact on IPV. It could also be that the relevant threshold from which IPV decreases has not yet been reached in the context of Mexico, which could be due to the importance of traditional gender roles.

One possible explanation for the U-shaped relationship is that, as the woman's relative income increases, IPV might decline through an improvement in her relative bargaining power. As her income approaches his, however, any potential reduction in IPV due to her improved bargaining position might be offset by the threat to the man's dominant position, which increases the probability that he uses IPV in order to restore his power and reassert his dominant role.

Robustness checks

In this section, I test for the robustness of my findings to alternative specifications. First, I provide empirical support that the instrument is not driven by the underlying characteristics of the workers. Second, I also show that it is not sensitive to alternative constructions of it. Finally, I present evidence that the estimates are robust to, for instance, controlling for additional variables and changing the sample size.

State level covariates

One might wonder whether the instrument is driven by the underlying workers' characteristics. For instance, there might be unobserved factors that drive selective in-migration of women (men). If these women (men) are more likely to work in high-paying industries, as well as less likely to be victims of (inflict) violence, the validity of my instrument would be questioned. I diminish this concern by controlling for variables that could lead to migration across states, as well as reflect compositional changes in the state that could be correlated with both income and IPV. I specifically include the male's homicide rate, as a proxy for the general level of violence; the impunity rate, as a proxy for the efficiency of the criminal justice system; and the unemployment rate, as a proxy for economic conditions. In addition, I directly control for the percentage of female (male) in- and out-migrants in the own age group[37]. Column 1 of table 2.6 reproduces the baseline estimates of table 2.3. Specifications 2-5 enter each of the four state level variables separately, while specification 6 includes all of them together. As can be seen, including state level covariates barely affects the estimates.

[37]See details about the construction of these variables in the Data Appendix.

Table 2.6: Effect of women's relative income on IPV – Robustness checks: State level covariates

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Physical						
Relative income	-2.597***	-2.604***	-2.590***	-2.598***	-2.598***	-2.600***
	(0.808)	(0.808)	(0.809)	(0.808)	(0.810)	(0.811)
Relative income sq	2.948***	2.956***	2.942***	2.949***	2.946***	2.950***
	(0.741)	(0.741)	(0.741)	(0.741)	(0.742)	(0.743)
Panel B: Sexual						
Relative income	0.011	0.011	0.007	0.005	0.014	0.006
	(0.523)	(0.523)	(0.526)	(0.522)	(0.525)	(0.526)
Relative income sq	0.411	0.410	0.414	0.416	0.413	0.419
	(0.513)	(0.513)	(0.515)	(0.512)	(0.513)	(0.514)
Panel C: Emotional						
Relative income	-6.705***	-6.711***	-6.678***	-6.703***	-6.701***	-6.684***
	(1.642)	(1.642)	(1.652)	(1.641)	(1.632)	(1.640)
Relative income sq	7.629***	7.636***	7.605***	7.628***	7.620***	7.607***
	(1.627)	(1.626)	(1.636)	(1.626)	(1.617)	(1.624)
Panel D: Economic						
Relative income	-6.287***	-6.288***	-6.277***	-6.298***	-6.280***	-6.282***
	(1.477)	(1.472)	(1.479)	(1.475)	(1.469)	(1.461)
Relative income sq	7.158***	7.159***	7.150***	7.168***	7.153***	7.156***
	(1.366)	(1.359)	(1.368)	(1.365)	(1.358)	(1.351)
Homicide	No	Yes	No	No	No	Yes
Impunity	No	No	Yes	No	No	Yes
Unemployment	No	No	No	Yes	No	Yes
Migration	No	No	No	No	Yes	Yes
F statistic	72.15	72.34	71.66	71.79	71.62	71.47
Observations	136,818	136,818	136,818	136,818	136,818	136,818

Notes: 2SLS estimates reported. Robust standard errors clustered at the state level in parentheses. F statistic refers to the Kleibergen-Paap rk Wald F statistic. Column 1 reports the baseline estimates of table 2.3. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, state and year fixed effects, and two indicators of whether woman's relative income is zero or one. ***significant at 1% level, **at 5%, *at 10%.

Sensitivity of the instrument to its construction

I next test the sensitivity of my estimates to the construction of the instrument. Results are reported in table 2.7. First, I consider 2002[38], instead of 2003, as the baseline

[38]Specifically, the last quarter of 2001 and the first three quarters of 2002.

year for calculating the industry share component of the instrument (column 2). Second, I employ income in natural logarithms instead of levels (column 3).

Table 2.7: Effect of women's relative income on IPV – Robustness checks: IV construction

	(1)	(2)	(3)	(4)	(5)
	Baseline	Base year 2002	Ln income	Overall income	Calendar year
Panel A: Physical					
Relative income	-2.597***	-2.933***	-3.010***	-3.059***	-2.857***
	(0.808)	(0.850)	(0.928)	(0.810)	(0.786)
Relative income sq	2.948***	3.217***	3.309***	3.221***	3.126***
	(0.741)	(0.769)	(0.840)	(0.747)	(0.727)
Panel B: Sexual					
Relative income	0.011	-0.067	-0.377	-0.380	-0.214
	(0.523)	(0.609)	(0.574)	(0.502)	(0.500)
Relative income sq	0.411	0.452	0.729	0.715	0.577
	(0.513)	(0.580)	(0.558)	(0.495)	(0.491)
Panel C: Emotional					
Relative income	-6.705***	-7.202***	-7.827***	-7.148***	-6.924***
	(1.642)	(1.738)	(1.846)	(1.588)	(1.668)
Relative income sq	7.629***	7.994***	8.607***	7.860***	7.798***
	(1.627)	(1.697)	(1.807)	(1.569)	(1.651)
Panel D: Economic					
Relative income	-6.287***	-6.670***	-7.158***	-6.541***	-6.416***
	(1.477)	(1.590)	(1.627)	(1.377)	(1.482)
Relative income sq	7.158***	7.446***	7.922***	7.171***	7.247***
	(1.366)	(1.449)	(1.497)	(1.271)	(1.371)
F statistic	72.15	59.95	60.54	58.50	73.13
Observations	136,818	136,818	136,818	136,818	136,818

Notes: 2SLS estimates reported. Robust standard errors clustered at the state level in parentheses. F statistic refers to the Kleibergen-Paap rk Wald F statistic. Column 1 reports the baseline estimates of table 2.3. Modifications of the IV: column 2 considers 2002 as the baseline year, column 3 defines income in natural logarithms, column 4 considers the overall income and column 5 defines the IV using the calendar year of ENDIREH. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, state and year fixed effects, and two indicators of whether woman's relative income is zero or one. ***significant at 1% level, **at 5%, *at 10%.

Third, I construct the instrument using the overall income at the national level rather than the income by gender, for both women and men (column 4). The reason is that,

given that I use self-reported income, it could be that women and men have changed their reporting behaviour along with the business cycle, and that this change has not followed a similar path. Finally, I consider the calendar year of the survey year, instead of the fourth quarter of the year before and the three quarters of the year in question (column 5). In short, table 2.7 shows that the estimated parameters are not sensitive to the baseline year considered, the functional form of income used, the definition of income and the time period considered for constructing the instrument.

Additional robustness checks

Finally, I conduct a bunch of additional robustness tests, which are reported in table 2.8. First, I control for whether the woman could benefit from unilateral and no-fault divorce. The introduction of this type of divorce reduces the cost of dissolving the marriage, which could affect the probability that men inflict IPV, as previous studies have shown (Brassiolo, 2016; Stevenson and Wolfers, 2006). In particular, I create a dichotomous variable equal to one if the woman is married and resides in a state that has introduced unilateral and no-fault divorce during my time span (i.e. Mexico City or Hidalgo)[39]. Column 2 shows that, overall, the estimates are very close to those reported in column 1.

Second, I include municipality instead of state fixed effects. Municipality fixed effects might better account for differences in access to health clinics and shelters, since these services can vary considerably across municipalities within the same state. In addition, they control for time-invariant differences in labour market conditions across municipalities, which could directly impinge on IPV. Column 3 reports the coefficients of interest, which are slightly smaller than the baseline ones, but the main conclusions remain unchanged.

[39]Mexico City introduced unilateral and no-fault divorce in August 2008, while Hidalgo in March 2011.

Table 2.8: Effect of women's relative income on IPV – Robustness checks: Additional tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline	UD	Mun FE	Respondent	RW=0.5	Couple's income	Exclude 2003	Weights
Panel A: Physical								
Relative income	-2.597***	-2.631***	-2.166***	-2.613***	-2.992***	-2.781***	-2.985***	-2.177
	(0.808)	(0.809)	(0.817)	(0.810)	(1.078)	(0.859)	(0.931)	(1.343)
Relative income sq	2.948***	2.974***	2.555***	2.959***	3.333***	3.209***	3.307***	2.772**
	(0.741)	(0.742)	(0.758)	(0.742)	(1.025)	(0.819)	(0.890)	(1.272)
Panel B: Sexual								
Relative income	0.011	0.018	0.101	0.006	-0.103	0.312	-0.271	0.720
	(0.523)	(0.528)	(0.529)	(0.527)	(0.638)	(0.561)	(0.517)	(0.950)
Relative income sq	0.411	0.405	0.311	0.415	0.465	-0.016	0.779	-0.233
	(0.513)	(0.516)	(0.531)	(0.516)	(0.619)	(0.555)	(0.535)	(1.125)
Panel C: Emotional								
Relative income	-6.705***	-6.745***	-6.146***	-6.732***	-7.506***	-6.497***	-7.144***	-5.598
	(1.642)	(1.655)	(1.680)	(1.635)	(1.975)	(1.691)	(1.577)	(3.727)
Relative income sq	7.629***	7.660***	7.106***	7.649***	8.380***	7.334***	8.060***	7.111*
	(1.627)	(1.636)	(1.667)	(1.619)	(1.974)	(1.687)	(1.603)	(3.811)
Panel D: Economic								
Relative income	-6.287***	-6.300***	-5.250***	-6.288***	-7.540***	-5.768***	-6.995***	-7.117**
	(1.477)	(1.485)	(1.362)	(1.477)	(1.810)	(1.549)	(1.560)	(2.849)
Relative income sq	7.158***	7.168***	6.201***	7.157***	8.435***	6.424***	7.825***	8.121***
	(1.366)	(1.372)	(1.297)	(1.364)	(1.717)	(1.410)	(1.501)	(2.770)
F statistic	72.15	72.65	72.28	74.44	42.68	50.44	49.12	16.44
Observations	136,818	136,818	136,818	136,818	136,818	136,818	136,818	136,818

Notes: 2SLS estimates reported. Robust standard errors clustered at the state level in parentheses. F statistic refers to the Kleibergen-Paap rk Wald F statistic. 'Mun' stands for municipality and 'FE' for fixed effects. Column 1 reports the baseline estimates of table 2.3. Column 2 includes an indicator of whether the woman can benefit from unilateral and no-fault divorce, column 3 controls for municipality FE, column 4 controls for whether the respondent to the income question is the woman, her partner or another person, column 5 excludes women with a relative income equal to 0.5, column 6 instruments for the couple's total income, column 7 excludes the year 2003 and column 8 weights the estimates by the survey sampling weights. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, state and year fixed effects, and two indicators of whether woman's relative income is zero or one. ***significant at 1% level, **at 5%, *at 10%.

The third robustness check is related to the peak in the middle of the relative income distribution, which could be driven by measurement error of the incomes. I first analyse whether this peak is related to who is the respondent of the income question in the survey and, if so, whether the results are sensitive to controlling for this. As I mentioned earlier, in 2003 and 2006 the woman provides the information about income, while in 2011 this can be done by any member of the household. In order to examine the implications of this in 2011, I create a dichotomous variable equal to one if the woman's relative income is 0.5 and zero otherwise, and regress it on an indicator of whether the respondent is the eligible woman, her partner or any other member of the household.

Results are reported in table A5 in the Appendix. The probability of having a relative income equal to 0.5 is significantly lower when the eligible woman is the respondent, whereas significantly higher when her partner or other members of the household answer this question. Given this, I re-estimate equation 2.1 controlling for whether the woman, her partner or another person is the respondent. Specification 4 of table 2.8 report the results, which confirm the baseline findings. In addition, in column 5 I exclude women with a relative income equal to 0.5 to test that the U-shaped pattern is not driven by them. The estimates of interest remain largely unaffected.

Fourth, I also instrument for the couple's total income using the sum of the woman's predicted income and the man's predicted income as an instrument, since this variable is likely to be endogenous. Specification 6 shows that the baseline estimates reported in column 1 are confirmed.

Fifth, I exclude the year 2003 from my analysis, since the survey design varied with respect to that used in 2006 and 2011 (column 7). The coefficients are slightly larger, but confirm the baseline findings. In addition, in column 8 the estimates are weighted by the survey sampling weights. As can be seen, the estimates are not very different to those reported in column 1, but they are less precise. For physical and emotional IPV, the first-order coefficient is no longer significant. However, the significance of the first-order coefficient is not necessary. Indeed, when I conduct the test proposed by Lind and

Mehlum (2010), the U shape is confirmed and the turning point is similar to the one reported for the baseline results.

As a final exercise, I also check that the U-shaped relationship for physical, emotional and economic IPV is not driven by the extreme values of the woman's relative income (zero and one). For this purpose I conduct the U test proposed by Lind and Mehlum (2010) restricting the data range to [0.1, 0.9]. The p-values are very similar to those presented in table 2.4. Overall, estimates in table 2.8 confirm the baseline findings. Furthermore, the thresholds are very close to the ones reported in table 2.4 and the U test confirms the U-shaped relationship in all cases.

Is there a linear relationship between women's relative income and IPV?

Table 2.9 re-estimates equation 2.1 assuming that the relationship between a woman's relative income and IPV is linear. After controlling for endogeneity and at least individual level covariates (columns 4-7), the estimates suggest that a woman's relative income does not have a significant linear effect on the prevalence of physical, emotional and economic IPV, whereas it does on that of sexual violence. In particular, a 0.1 increase in the woman's relative income is predicted to raise the prevalence of sexual violence by 0.024-0.038 (columns 6-7). Given that the average value of this type of abuse in my sample is 0.046, these figures are large in economic terms.

Table 2.9: Effect of women's relative income on IPV – Linear specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS		2SLS				
Panel A: Physical							
Relative income	0.039***	0.000	-0.110***	0.043	0.045	0.069	0.081
	(0.004)	(0.008)	(0.024)	(0.121)	(0.110)	(0.105)	(0.185)
Panel B: Sexual							
Relative income	0.026***	-0.002	-0.053***	0.241***	0.220***	0.236***	0.384***
	(0.003)	(0.007)	(0.017)	(0.092)	(0.084)	(0.081)	(0.141)
Panel C: Emotional							
Relative income	0.057***	-0.078***	-0.086**	0.153	0.141	0.176	0.226
	(0.005)	(0.012)	(0.035)	(0.210)	(0.184)	(0.174)	(0.306)
Panel D: Economic							
Relative income	0.016***	-0.085***	-0.039	0.095	0.090	0.139	0.216
	(0.006)	(0.013)	(0.027)	(0.216)	(0.197)	(0.183)	(0.324)
State/Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual	Yes	Yes	No	Yes	Yes	Yes	Yes
Couple	Yes	Yes	No	No	Yes	Yes	Yes
Household	Yes	Yes	No	No	No	Yes	Yes
Extremes	No	Yes	No	No	No	No	Yes
F statistic			679.26	45.96	62.92	68.20	281.23
Observations	136,818	136,818	136,818	136,818	136,818	136,818	136,818

Notes: OLS (columns 1-2) and 2SLS (columns 3-7) estimates reported. Robust standard errors clustered at the state level in parentheses. F statistic refers to the Kleibergen-Paap rk Wald F statistic. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. 'Individual' includes both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories) and woman's experience of violence in her childhood. 'Couple' includes couple's total income, marital status, length of the relationship, number of young children and whether the couple lives alone. 'Household' includes urban residence, SES index and whether more than one woman was interviewed in the household. 'Extremes' includes two indicators of whether the woman's relative income is zero and whether it is one.***significant at 1% level, **at 5%, *at 10%.

2.7 Conclusion

The relationship between a woman's economic status and IPV has long been of interest in the economics literature. Previous research, however, presents three main limitations. First, it has primarily assumed a linear relationship. Second, it has usually considered absolute measures of woman's economic status. Third, it has mainly focused on physical IPV. This paper has overcome these three limitations by using a relative measure of woman's income (i.e. her income share over the couple's total income) and examining

whether it has a non-monotonic impact on the prevalence of physical, sexual, emotional and economic IPV. To account for the potential endogeneity of the woman's relative income, I have exploited the initial industry composition of the state and the industry-specific income changes at the national level.

My findings suggest a U-shaped effect of a woman's relative income on the prevalence of physical, emotional and economic IPV. That is, as the woman's relative income increases, the probability of IPV decreases up to a turning point, which occurs at a relative income equal to 0.31 or 0.44, after which it increases. This suggests that previous studies might have led to misleading conclusions by assuming a monotonic relationship. In the case of sexual IPV, the relationship of interest seems to be linear. Specifically, an increase in the woman's relative income is predicted to increase the prevalence of sexual IPV.

Although my results are robust to a number of checks (e.g. adding additional covariates, changing the definition of the instrument and accounting for potential confounding reforms), they have to be interpreted carefully given the cross-sectional nature of the data. This does not allow me to control for unobserved individual factors that could be contaminating the relationship of interest. This is a common limitation of research on IPV, since surveys rarely interview the same woman over time.

The findings in this paper shed some light on what type of interventions to prevent IPV could work. In particular, economically empowering women can reduce IPV as long as her income is lower than her partner's. A programme in this line is *Seguro contra la violencia familiar* (Insurance against family violence), which was implemented in Mexico City for the first time in 2009. One of its goals is to provide an income transfer to the victim to make her economically independent from the abuser. These types of initiatives can be useful to help women leave a violent relationship and start a 'new' life. However, women may continue to be victims of violence if they decide to stay[40]. For instance, their partner could use IPV in order to extract these additional resources. Furthermore, my

[40]These types of programmes assume that women stay with the abuser because they are economically dependent, but economic factors might not be the real underlying reason. Only 2% of abused women in my sample report that this is the case.

findings also show that economically empowering women can have adverse consequences on them. It can lead to an increase in violence if the woman's improved economic position is perceived as a threat by her partner to his dominant position.

Taken together, the evidence in this paper suggests the need for programmes aimed at not only economically empowering women, but also changing the unequal gender power structures and how they are perceived by both partners, since this constitutes one of the main roots of IPV. The latter requires a more complex strategy, which would need of a combination of initiatives including specific programmes aimed at changing socially prescribed gender roles, as well as curricula that educate new generations into different forms of conflict resolution.

Chapter 3

Divorce laws and intimate partner violence Evidence from Mexico

3.1 Introduction

Intimate partner violence (IPV)[1] is a serious public health problem. In Mexico, estimates indicate that about 37% of married (74% of divorced) women have experienced it at some point during their current (past) relationship. IPV is also associated with a wide range of negative outcomes for victims including unstable employment, reductions in productivity and earnings, and poor health (Campbell, 2002; Farmer and Tiefenthaler, 2004; Lloyd, 1997; Tolman and Wang, 2005); as well as negative externalities on children (Aizer, 2011; Carrell and Hoekstra, 2010; Pollak, 2004). In this context, it is crucial to understand what can be done to prevent IPV. Economists have provided some insights into this question by examining factors that could potentially affect violence, including labour market opportunities (Aizer, 2010; Anderberg et al., 2015), conditional cash transfer (CCT) programmes (Angelucci, 2008; Bobonis et al., 2013), historical factors (Alesina et al., 2016a; Tur-Prats, 2015), and arrest and prosecution policies (Aizer and Dal Bó, 2009; Iyengar, 2009).

There is still, however, little evidence of the impact of divorce laws on IPV, both inside and outside economics. This paper examines this question by exploiting the variation in the timing of the introduction of unilateral and no-fault divorce (hereafter unilateral divorce) across Mexican states. Unilateral divorce implies that either of the two spouses can file for divorce without the consent of the other and without the need to prove fault. Studying divorce laws is important because, by regulating the dissolution of the marriage, they are likely to affect intra-household dynamics including the experience of IPV.

To the best of my knowledge, only two papers have examined the impact of divorce laws on IPV (Brassiolo, 2016; Stevenson and Wolfers, 2006). Both of them find a significant decrease in IPV following a reduction in the cost of divorce. However, they focus on developed countries, namely Spain and United States, respectively, whose findings might not apply to the case of developing countries. The main reason lies in the different socio-

[1] I use IPV, violence and abuse interchangeably.

economic and cultural contexts, including the importance of religion[2]. For instance, in developing countries, there is evidence that IPV is relatively more normal, there is less support for victims, more difficulties enforcing alimony payments and child maintenance, and fewer outside options for women. Divorce is also less culturally accepted[3] (Heise and Kotsadam, 2015; WHO, 2002, 2014). All these reasons might make women less likely to divorce and/or men more likely to inflict IPV in response to a reduction in the cost of divorce in developing countries compared to their counterparts in developed ones. Consequently, it is not clear *a priori* whether the effect of unilateral divorce on IPV will be similar in both settings. For instance, one could observe an increase, instead of a decrease, if easier divorce leads to what is known as a 'male backlash effect'[4].

The primary contribution of my paper is, thus, to empirically examine the relationship between easier divorce and IPV in the context of a developing country. To do so, I focus on Mexico, which provides a unique case study for analysing the question of interest. First, divorce laws are determined at the state level, which allows me to exploit the staggered implementation of unilateral divorce. Similar divorce reforms in other countries have occurred at the national level[5]. Second, the timing of the reform and the availability of data are appropriate to examining the impact of easier divorce on IPV in a Difference-in-Differences (DiD) framework, which will provide an estimate of the average causal effect of the reform. In particular, there is information on IPV both before and after the law changes, which is not the case for the other reforming countries of the region.

[2]According to the 2010 Population Census, 83% of Mexicans consider themselves as Catholics. Moreover, a national survey on the values and attitudes of Catholics conducted in 2006 found that only 19% of Catholics do not (or very rarely) attend religious services. Although one might argue that Catholicism is also very important in Spain, the percentage of practicing Catholics has sharply decreased over time. According to the CIS Barómetro of 2006, 78% of Spanish consider themselves as Catholics of which 53% never (or very rarely) attend mass.

[3]Comparing Mexico to United States, Mexico's crude divorce rate was 0.7 in 2006, whereas in United States it was 3.7 (data from the United Nations).

[4]In this context, a 'male backlash effect' occurs when the husband perceives the improvement in the wife's outside option-through the reduction in the cost of divorce- as a threat to his culturally prescribed dominant role.

[5]Nicaragua allowed for unilateral divorce in 1988. In Uruguay, since 2013 unilateral divorce can be filed for after four months of being married. Previously, only women could unilaterally file for it, but there was a two-year marriage requirement. More recently, Argentina (2015) has moved towards unilateral divorce without any temporal requirement.

In order to estimate the causal impact of reducing the cost of divorce on IPV, I use three waves (2003, 2006 and 2011) of a nationally representative survey called ENDIREH[6]. I employ a DiD approach and estimate the effect of the reform on four types of IPV, namely physical, sexual, emotional and economic.

My baseline results indicate that sexual, emotional and economic IPV have declined by 1.7, 4.9 and 4.3 percentage points, respectively, in treatment states relative to control ones following the reform. Compared to the prevalence of IPV in the treatment group prior to the divorce reform, this corresponds to a 30%, 23% and 20% decline in IPV, respectively. This reduction is mainly driven by couples who continue to remain married after the reform. In the case of physical IPV, the effect is found to be insignificant and close to zero, which is not explained by the definition of violence used or by heterogeneous effects of the reform.

I next examine whether easier divorce might have led to a substitution effect across types of IPV by constructing a set of indicators that capture different combinations of violence. I find that the significant decline in sexual, emotional and economic IPV only holds when these types of abuse are not associated with physical violence (and/or sexual IPV in the two latter cases). I also find that physical and sexual IPV occurring alone or with no associated emotional and/or economic violence have significantly increased after the reform. Taken together, these results suggest that the reduction in the cost of divorce might have led to a substitution of emotional and economic IPV for physical and sexual violence. My findings are not in line with the classical prediction of divorce threat models. Instead, they are consistent with a 'male backlash effect' explanation by which unilateral divorce has been perceived by the husband as a threat to his dominant position. They are also consistent with an explanation by which men use IPV as an instrument to prevent their wives from leaving the marriage. If these two mechanisms are in place, one would expect the substitution effect to be concentrated on wives and husbands with 'traditional' views on gender roles (Overall et al., 2016). I find that this is, indeed, the case.

[6] *Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares* (National Survey on the Dynamics of the Relationship within the Households).

There are at least two reasons –consistent with my data– that could explain why 'male backlash effect' or 'divorce prevention' explanations are in line with an increase in physical and sexual IPV, but not other forms of violence. First, physical and sexual IPV are less common and, as a result, more likely to have a greater impact on the wife's behaviour than emotional and economic abuse. Second, women usually consider physical and sexual IPV to be 'more serious' than emotional and economic abuse. Related to this, they tend to be more afraid of physical and sexual IPV, which makes these types of violence particularly suitable to create an atmosphere of fear (Radford and Harne, 2008). Together, these reasons suggest that physical and sexual IPV might be more 'effective' than other types of violence, at least in the short-run, which would make men more likely to use them as an instrument to reassert their dominance and to prevent their wives from divorcing.

Finally, I estimate the effect of unilateral divorce on a proxy for the woman's bargaining power in the household, namely her contribution to decision-making. My results indicate that, after the reform, the woman's absolute and relative decision-making power has significantly increased in the treatment, as compared to the control, group. Although divorce threat models posit that this improvement could work as as a channel through which easier divorce decreases IPV, this is unlikely to be the case in my context. The reason is that the decline in sexual, emotional and economic IPV has been accompanied by an increase in physical and sexual IPV occurring alone or with no associated emotional and/or economic violence, which seems to be consistent with 'male backlash effect' and 'divorce prevention' explanations.

In addition to examining the relationship between divorce laws and IPV in the context of a developing country, the results of this paper contribute to the previous literature in a number of other ways. First, they highlight the importance of analysing potential substitution effects across types of IPV; an analysis very rarely conducted in the literature. Second, they indicate that the spouses' views on gender roles are an important source of variation in explaining the impact of unilateral divorce on IPV, which is consistent with previous findings focusing on income (e.g. Angelucci (2008) and Atkinson et al. (2005)).

Third, they shed some light on the determinants of the intra-household distribution of power by showing an improvement in the woman's decision-making power following a reduction in the cost of divorce. Finally, they inform about the potential consequences of unilateral divorce in the specific case of Mexico. This is of particular importance in the context of this country, where states are gradually moving towards unilateral divorce and where this move is facing the opposition of conservative sectors of the society.

The rest of the paper is organised as follows. Section 3.2 briefly reviews previous related literature. Section 3.3 describes the divorce reform in Mexico. Section 3.4 specifies the identification strategy. Section 3.5 describes the data and presents some descriptive statistics. Section 3.6 reports the baseline results, conducts some robustness tests and examines the potential reasons behind my findings. Section 3.7 looks at the effect of easier divorce on the woman's bargaining power. Section 3.8 provides some conclusions and discusses the implications of the study.

3.2 Related literature

Divorce threat models predict that easier access to divorce divorce will decrease IPV through two main channels. The first works through a decrease in the probability of abuse within intact marriages. The idea is that easier divorce makes the threat of divorce more credible, which redistributes bargaining power towards the spouse relatively more willing to divorce. In the context of abusive relationships, she would presumably be the abused partner, who can use her improved bargaining position to lower the level of violence.

The second mechanism works through an increase in the probability that abused women divorce, since the reduction in the cost of divorce makes the dissolution of violent relationships easier. A necessary condition for this latter channel is that divorce rates have changed following the adoption of unilateral divorce. This was one of the earliest studied outcomes in the divorce literature[7]. Most of these studies have found a

[7]Other outcomes include marriage rates (Rasul, 2006), woman's labour supply (Bargain et al., 2012; Gray, 1998; Stevenson, 2008), home production (Gray, 1998), children's outcomes (Gruber, 2004), fertility decisions (Bellido and Marcén, 2014; Drewianka, 2008) and violent crime (Delpiano and Giolito, 2012).

significant increase in divorce rates following a reduction in the cost of divorce, at least in the short run (see Friedberg (1998) and Wolfers (2006) for a state-level analysis in the United States, and González and Viitanen (2009) and Kneip and Bauer (2009) for a cross-country analysis in Europe). Nevertheless, the end of the marriage does not necessarily lead to the end of violence (Aizer and Dal Bó, 2009). This is confirmed by my 2006 sample in which 40% of divorced women who were abused during their last marriage, have also experienced IPV inflicted by their ex-husband after divorcing.

In spite of the theoretical association between divorce laws and IPV, the empirical evidence remains scarce. To the best of my knowledge, only two papers in the economics literature have looked at the effect of divorce laws on IPV. The earliest one is Stevenson and Wolfers (2006), who exploit the state-level variation in the timing of the introduction of unilateral divorce in United States. Employing a DiD strategy and two waves (1976 and 1985) of a national survey on physical violence, they find a large decline in both male-to-female and female-to-male IPV. One of the main limitations of this paper is the fact that they only have two survey waves and, by the time of the first wave, 31 states had already introduced unilateral divorce, while 37 had done so by the time of the second one. In order to mitigate this latter concern, they use alternative control groups and show that their estimates are not sensitive to them[8].

In a more recent paper, Brassiolo (2016) analyses the impact of a 2005 reform that significantly reduced the cost of divorce in Spain on male-to-female IPV[9]. Using cohabiting women as a control group, he finds a significant decrease in IPV following the reform. He also finds that women in the middle and bottom of the education distribution, and those without young children appear to have benefited the most from the reform. Furthermore,

[8]Stevenson and Wolfers (2006) also examine the impact of unilateral divorce on intimate homicides. Their results show a significant decrease in male-to-female homicides, while the estimates are insignificant when female-to-male homicides are considered. These findings stand in sharp contrast to the ones in Dee (2003), who reports an insignificant effect of unilateral divorce on spousal homicides of wives, whereas a significant increase in spousal homicides of husbands. The latter is concentrated in states with matrimonial property laws that favour the husbands. Given this, he suggests that the increase in homicides of husbands might be due to a loss of the wife's bargaining power.

[9]This reform eliminated, among other things, the need for one-year judicial separation before a divorce could be filed, reduced the mandatory marriage length before dissolution from one year to three months, and introduced unilateral and no-fault divorce.

Brassiolo (2016) attempts to disentangle whether the reduction in violence is due to a decrease in the propensity towards violence of married couples or to an increase in the propensity of abused women to dissolve the marriage. He does so by comparing the estimate obtained using the whole universe of women who were married at the time of the reform, regardless of their marital status at the time of the survey, with the estimate obtained when the sample is restricted to women who were married at the time of the reform and continue to be so at the time of the survey. He finds that the bulk of the decline is concentrated on the latter, which provides support for the first mechanism[10].

In the context of Mexico, a recent paper (Beleche, 2017) sheds some light on the effect of three reforms related to domestic violence (i.e. criminalisation of domestic violence in the Penal Code, inclusion of domestic violence as a ground for divorce and adoption of the Law of Access, Assistance and Prevention against Intra-Family Violence) on IPV. The objective of this study is to estimate the impact of these reforms on female suicide rates by exploiting their staggered introduction. The results show a significant decrease in suicide rates in adopting states, as compared to non-adopting ones, following the introduction of the Penal Code reform; whereas no significant effect is reported for the other two reforms[11]. In order to examine the possible mechanisms behind her findings, she looks at the effect of the Penal Code reform on IPV using the ENDIREH 2003 sample. She finds a significant decline in the probability of physical and sexual violence, while an insignificant effect is obtained for emotional abuse.

In addition to the divorce literature, my paper is also closely related to a body of research that aims to understand the determinants of IPV. In this regard, most attention has been devoted to the relationship between a woman's economic status and IPV. Studies from developed countries have usually reported a negative association between both (Aizer, 2010; Anderberg et al., 2015), which is consistent with the classical prediction of

[10]Stevenson and Wolfers (2006) cannot disentangle both channels because their survey only captures information on married couples.

[11]Stevenson and Wolfers (2006) also look at the effect of unilateral divorce on suicide rates and find a significant decrease in female suicide rates following the reform, while the effect for male suicide rates seems to be insignificant.

divorce threat models. By contrast, evidence from developing countries has been mixed.

In the context of Mexico, two papers have studied the impact of the antipoverty CCT programme *Oportunidades* on IPV (Angelucci, 2008; Bobonis et al., 2013). Bobonis et al. (2013) find that beneficiary women are less likely to experience physical IPV, but more likely to experience threats of violence with no associated physical violence compared to non-beneficiary women. They suggest that this may be driven by a motive of rent extraction. Exploiting the initial random implementation of the programme in rural villages, Angelucci (2008) examines its impact on drunken IPV. She finds different results depending on the magnitude of the income transfer and the husband's level of education. Violence decreases for households entitled to small transfers and for households entitled to large transfers where husbands have completed primary education, whereas it increases for households entitled to large transfers where husbands have not completed primary education. She suggests that men without primary education might hold 'traditional' views on gender roles and, consequently, they might perceive income transfers targeted at women as a threat to their dominant position (i.e. a 'male backlash effect' occurs).

Evidence from other regions is also mixed. In the context of India, Amaral (2017) finds that the probability of experiencing IPV decreases following a reform that improves women's inheritance rights. Using an instrumental variable (regional variation in the impact of rainfall shocks on female labour demand in rural areas) approach, Chin (2012) reports a negative effect of working for pay on the probability of physical IPV. This result stands in sharp contrast to the one in Luke and Munshi (2011) employing female income and a similar methodology.

Taken together, the literature has shown that, in the context of a developing country, an improvement in the woman's outside option will not necessarily decrease IPV, as was already suggested in section 3.1. This is empirically examined for the case of divorce laws in the following sections.

3.3 Reform of the divorce legislation in Mexico

In Mexico, divorce laws are determined at the state level. The first state to introduce unilateral divorce was Mexico City[12] in August 2008, followed by Hidalgo in March 2011 and ten other states between 2012 and 2017[13]. Given that the last wave of the survey was conducted in 2011, I only have two treatment states, namely Mexico City and Hidalgo.

In Mexico City, the Legislative Assembly approved unilateral divorce on 27th August 2008 by amending the Civil Code and the Code of Civil Procedures[14]. This reform was published in the *Gaceta Oficial* of the Federal District on 3rd October, which came into effect 30 days after it. In Hidalgo, the Congress approved unilateral divorce on 18th March 2011 by amending the Family Law and the Code of Family Procedures[15]. This was published in the *Periódico Oficial* of the State of Hidalgo on 31st March and came into effect 60 days after it. Under the new legislation, any of the two spouses can ask for the dissolution of the marriage without the consent of the other and without the need to prove fault. In the case of Mexico City there is the specific requirement of having been married for at least one year. The procedure of unilateral divorce is judicial and requires filing for it at the Family Court.

In the old divorce regime, if a partner wanted to unilaterally dissolve the marriage, she needed to prove a cause, which included, among others, the usual causes of domestic violence[16], infidelity and abandonment of the home. Fault divorce has been derogated in both Mexico City and Hidalgo. Alternatively, both partners could file for divorce by

[12]During my time span Mexico had 31 states and one Federal District, but for simplicity I refer to all of them as states. Recently the Federal District has changed its name to Mexico City.

[13]Guerrero and Estado de Mexico in 2012; Quintana Roo, Coahuila and Sinaloa in 2013; Nayarit in 2014; Aguascalientes and Yucatan in 2015; Queretaro in 2016; and Oaxaca in 2017.

[14]See pages 31-56 of the *Diario de los debates de la Asamblea Legislativa del Distrito Federal* of 27th August 2008. Complete text in `http://www.aldf.gob.mx/archivo-29d877a2d50013f22c7ee4613fc35a2d.pdf`. This text also contains information about the origins of the reform, the motivation for approving it and the voting results.

[15]See Decree 584 in `http://intranet.e-hidalgo.gob.mx/normatecae/archivos/dec584.pdf`. It also contains information about the motivation for approving the reform.

[16]Domestic violence as a cause for divorce was explicitly recognised in Mexico City, but not Hidalgo. To the best of my knowledge, a proposal for legislative reform presented in September 2008 requested its addition, but it was not added by the time unilateral divorce was approved. Even when domestic violence was not explicitly recognised, it could be grounded on the cause of 'brutality, threats and serious insults'.

mutual consent at the Family Court (judicial procedure), which required a mandatory one-year of marriage. This type of mutual consent divorce has been derogated in Mexico City, whereas in Hidalgo it does no longer have the one-year length of marriage requirement. Furthermore, in Mexico City there was, and still is after the reform, the so-called administrative divorce, which is a mutual consent divorce by administrative procedure. Thus, it needs to be filed for at the Civil Registry, instead of the Family Court, and requires having been married for at least one year[17]. Further information on the divorce types and requirements can be found in columns 1-4 of table B1 in the Appendix.

The benefits of the reform depend on the type of divorce spouses are likely to file for. If mutual consent is an option, this reform has not introduced any benefit in Mexico City, since they could file for mutual consent divorce by judicial procedure under the old regime and they can still file for administrative divorce if they fulfill the requirements. Comparing administrative to unilateral divorce, couples that qualify for the former are expected to file for it given its lower time[18] and likely economic cost[19]. Support for this is found in figure B1 in the Appendix, which depicts the divorce rate by type of divorce. It shows that the number of administrative divorces per 1,000 inhabitants has followed an increasing trend over time and this has not changed after the reform. In the case of Hidalgo, if mutual consent is an option, the reform has reduced the cost of divorce in terms of time, since mutual consent divorce does no longer require one year of marriage.

If mutual consent is not an option (which is likely in the context of violent marriages) or proving fault is difficult, this reform has clearly reduced the cost of divorce in time[20], monetary and emotional terms. However, the length of time and the cost needed to obtain unilateral divorce depend, among other things, on whether the spouses reach an agreement regarding the children's custody, alimony payments, use of marital home and

[17]It also requires being above 18, not having children under custody and having reached an agreement about the dissolution of the matrimonial property.

[18]Administrative divorce is usually granted within 15 and 30 days, while a judicial divorce requires at least one month.

[19]The cost of registering an administrative divorce in Mexico City is 1,050.00 Mexican pesos, while a judicial decree 208.90 (SEFIN, 2016). However, once legal fees have been taken into account, the overall cost of an administrative divorce is usually lower than that of a judicial divorce

[20]A fault divorce could take a minimum of six months.

dissolution of the matrimonial property.

The adoption of unilateral divorce has also been accompanied by changes in the economic compensation upon divorce. In particular, it has been made explicit that there needs to be a compensation for the spouse who has been responsible for the household chores and care of the children, or that has not acquired property (or of significantly lower value) during the marriage[21]. Although an economic compensation existed in the old divorce regime, in the case of fault divorce, it was only received by the innocent spouse. Thus, when there was no innocent spouse (e.g. divorce was grounded on a separation length of at least two years), none of the spouses received a compensation.

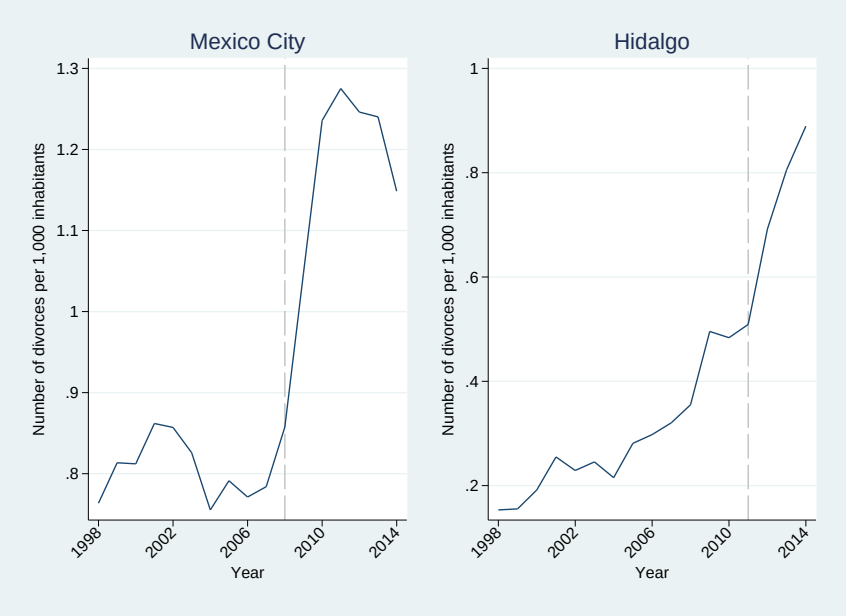
The reduction in the cost of divorce had immediate effects on divorce rates, as figure 3.1 shows. They boosted in the year following the reform with growth rates reaching 22% in Mexico City and 38% in Hidalgo. One possible reason for this large increase is that unilateral divorce could have increased divorce among couples that sooner or later were going to divorce, even if the law had not been passed. After the initial rise in divorces, the increasing trend decelerated in both states and, since 2012, the growth rate has become negative in Mexico City, which is consistent with findings in United States (Wolfers, 2006)[22].

Furthermore, the reduction in the cost of divorce could have had a differential impact on wives and husbands. As mentioned earlier, the spouse relatively more willing to exit the marriage, would have benefited the most from the reform. Looking at figure 3.2, which depicts the percentage of divorces petitioned by wives, husbands and both, women seem to be the most willing to exit the marriage. Further support for this is found when looking at fault divorces grounded on the cause of domestic violence (see figure B2 in the Appendix). Even when women file for divorce more often than men, the increase in the

[21] In Mexico City, this only occurs when the matrimonial property regime is separation, while in Hidalgo regardless of the regime (for more details see Article 267 VI of the Civil Code of the Federal District and Article 476 bis of the Code of Family Procedures of Hidalgo).

[22] One possible explanation for the negative growth rate is that, even if divorce rates among couples that were married when the divorce reform was introduced could have risen, divorce rates among post-reform married couples might have dropped to a larger extent, as Mechoulan (2006) finds for United States, which would have left a negative net effect.

Figure 3.1: Divorce rate

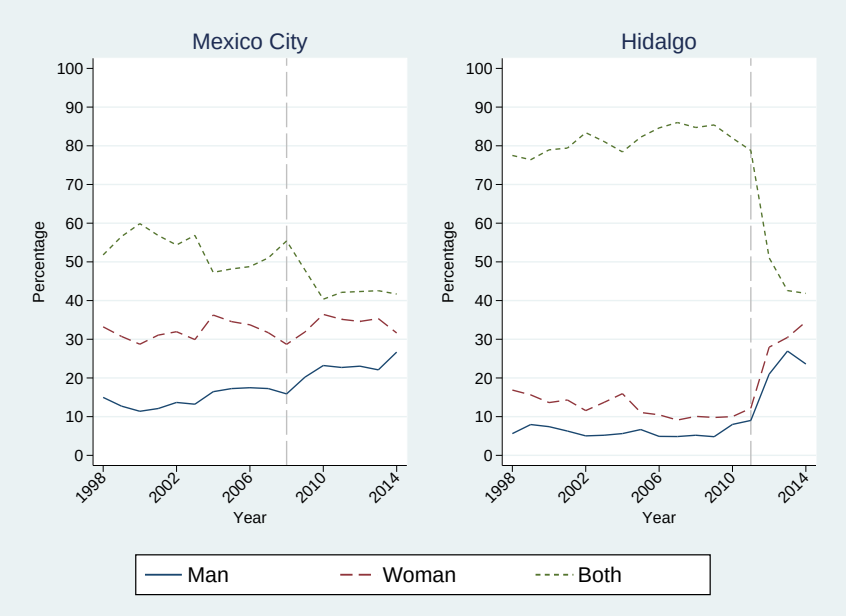


Notes: The vertical axes refer to the annual number of divorces per 1,000 inhabitants. The vertical lines refer to the year unilateral divorce was introduced (2008 in Mexico City and 2011 in Hidalgo). *Source:* Divorce statistics, INEGI

percentage of divorces initiated by them after the reform does not seem to be relatively larger than that experienced by men (see figure 3.2), which suggests that both spouses have benefited similarly from the reform. Filing for divorce is, however, only one part of a bigger picture. The reform could have benefited women relatively more than men even when they do not divorce. This would be the case if it has led to a redistribution of bargaining power towards them. In section 3.7, I will show that this seems to be, indeed, the case.

In addition, upon divorce, the change in the economic compensation rules is likely to have benefited women relatively more than men, since they usually fulfill the role of 'housewives' (58% of my sample) and acquire less assets during the marriage. In the case of Mexico City, this change only applies when the matrimonial property regime is separation. Even so, if couples are married under a community property regime, the spouse who has acquired less assets during the marriage, which is usually the wife, would be the one benefiting more from the regime. In Mexico, there is no matrimonial property

Figure 3.2: Percentage of divorces by who initiates divorce



Notes: The vertical axes refer to the percentage of divorces initiated by women, men and both. The vertical lines refer to the year unilateral divorce was introduced (2008 in Mexico City and 2011 in Hidalgo). *Source:* Divorce statistics, INEGI.

regime by default, but spouses need to choose it at the time of the marriage. They have the option of community and separate regimes, or a mix of both types[23]; and this has not changed with the reform. The survey provides information on the matrimonial property regime of couples in 2003, which indicates that 69% of them were married under a community property regime, 14% under a separate regime and 17% did not know the regime. If these numbers can be extrapolated to the two other years[24], I would expect that, overall, easier divorce has not damaged women in terms of property.

3.4 Identification strategy

In order to estimate the causal impact of reducing the cost of divorce on IPV, I take advantage of the natural experiment explained above. Specifically, the geographical and

[23]I do not have information on the matrimonial property regime of couples, which does not allow me to examine heterogeneous effects of the reform by this variable.

[24]Although this question is not directly asked in the other two years, I can infer the matrimonial property regime for the group of abused women in 2006, which shows that in most cases they are also married under a community property regime.

temporal variation in the introduction of unilateral divorce provides an ideal setting for a DiD framework. This approach compares the average prevalence of IPV in reform and non-reform states, before and after the reform. More formally, I pool the three survey years (2003, 2006, 2011) and estimate the following Linear Probability Model[25]:

$$IPV_{ist} = \beta_0 + \delta Treat_s \times Post_t + \beta_1 X_{ist} + \alpha_s + \gamma_t + \varepsilon_{ist} \tag{3.1}$$

where ist refers to woman i living in state s at the time of the survey observed in survey year t. The sample is restricted to married women at the time of the reform. IPV_{ist} is an indicator of whether the woman has experienced IPV in the past 12 months. $Treat_s$ is a dichotomous variable equal to one if the state has introduced unilateral divorce by 2011, i.e. if it is Mexico City or Hidalgo, and zero otherwise (the control group is formed by 9 non-reform states, which is explained below). $Post_t$ is an indicator of whether the survey was conducted in the post-treatment period i.e. 2011. δ is the DiD estimator or, in other words, the average change in the prevalence of IPV due to the divorce reform.

X_{ist} includes a set of time-varying covariates at the individual, couple and household level. These variables control for differences in observable characteristics across women that could have affected the selection into the state of residence, as well as IPV. α_s is a vector of state fixed effects for a woman's state of residence. It absorbs the treatment indicator, $Treat_s$. α_s controls for any time-invariant unobserved factor, such as access to health clinics and shelters, historical and cultural aspects, and policies that were introduced before my time span. γ_t is a vector of survey year fixed effects, which capture aggregate shocks including nationwide reforms (e.g. General Law on Women's Access to a Life Free of Violence of 2007). γ_t absorbs the post-treatment indicator, $Post_t$. ε_{ist} is the error term. I cluster the standard errors at the state level in order to allow for within-state

[25]I will also present marginal effects from estimating a Probit model. There is still a debate on how to interpret these marginal effects (Ai and Norton, 2003; Greene, 2010; Puhani, 2012). I follow Puhani (2012, p. 87) approach. He demonstrates that, in the case of DiD models, the treatment effect is equal to 'the cross difference of the conditional expectation of the observed outcome minus the cross difference of the conditional expectation of the potential outcome without treatment'.

autocorrelation of unobserved shocks (Bertrand et al., 2004)[26].

The introduction of unilateral divorce can be considered a valid natural experiment provided that, conditional on the covariates, the probability of being in the treatment group is random. To provide support for this, I first argue that the adoption of unilateral divorce was unanticipated in both Mexico City and Hidalgo. The origins of the divorce reform in Mexico City can be found in two initiatives for reforming the Civil Code and the Code of Civil Procedures of the Federal District presented by two political parties on 29 November 2007 and 20 May 2008. Early discussions between legislators and external stakeholders started in March 2008. After a process of debate, which was accompanied by media coverage, it was officially approved on 27 August 2008. Even when discussions started several months before its approval, it was unclear what change they would lead to. The reason lies in the 'pro-traditional family' support of large part of the Mexican population, which is reflected in the composition of the Legislative Assembly[27]. The final distribution of votes was as shown in figure B3 in the Appendix. All 'against votes' come from the conservative party, PAN (*Partido de Acción Nacional*) [National Action Party] and most of the 'in favour' votes from PRD (*Partido Revolucionario Democrático*) [Democratic Revolutionary Party], which is a party of progressive ideology and one of the proponents of the divorce reform.

In the case of Hidalgo, the origins of the divorce reform are based on the Initiative for Decree presented by the Executive Power of Hidalgo on 17 January 2011. A quick search on google reveals that prior to this date there were no news published in relation to unilateral divorce in this state. Moreover, even when unilateral divorce was approved two months later, the result of the Initiative was unclear *a priori*. As in Mexico City, the

[26]My preferred specification only includes 11 states, which is well below the accepted number of clusters in order to produce accurate standard errors. As a consequence of it, my standard errors are likely to be underestimated. One common practice for dealing with this shortcoming is to use the Wild cluster bootstrap-t procedure described in Cameron et al. (2008). As a robustness check, I will present the main results using these alternative standard errors.

[27]This is related to the importance of Catholicism in Mexico. As mentioned earlier, 83% of Mexicans are Catholics. This figure is 82% in Mexico City and 87% in Hidalgo. Moreover, according to the 2006 national survey on the values and attitudes of Catholics, 38% of Catholics are highly religious, 42% medium and 20% little. Moreover, 84% of Catholics say that religion is very important in their lives.

reason lies on the 'pro-traditional family' support of large part of the population, which is relatively more pronounced in Hidalgo than in the urban metropolis of Mexico City.

Even if unilateral divorce was unanticipated, given that the post-treatment data were collected after its approval, women and men could have adjusted their behaviour in response to its expected introduction, which would have changed the sample part of the treatment and control groups. First, unilateral divorce could have changed the incentives to marry. For instance, it might have encouraged women who were undecided about marrying to do so (González and Viitanen, 2009). If these new marriages are of lower (better) quality, IPV could have increased (decreased). Conversely, marriage rates could have also decreased following the reform (Rasul, 2003). In order to account for this, I restrict the sample to women who were married at the time of the reform-already mentioned above-, i.e. married for at least three years living in Mexico City or at least one year living in Hidalgo when the data was collected in the post-treatment period. I use the same definition for 2003 and 2006 in order to ensure comparability across years. Regarding women living in non-reform states, I take a conservative approach and restrict the sample to women who have been married for at least three years at the time of the survey.

Second, unilateral divorce could have pushed 'bad marriages' (i.e. most violent ones) to drop out of the sample. In order to examine whether this is the case, I restrict the sample to couples who were married at the time of the reform living in Mexico City or Hidalgo and compare the probability of experiencing IPV throughout the relationship between marriages that continue intact after the reform and those that split. A simple mean difference test shows that marriages that break up were significantly more violent than those that continue married. This could introduce sample selection bias because my preferred sample is restricted to marriages that remain intact after the reform. The reason is twofold. First, the definition of IPV for divorced/separated women is not comparable to that used for married women, as well as across survey years. Second, divorced/separated women were not surveyed in 2003. In order to reduce concerns of sample selection, I will also present estimates including all women who were married at the time of the reform,

regardless of their marital status at the time of the survey. This will also shed some light on the two channels posited by economists to explain the effect of divorce laws on IPV[28].

Third, the reform could have also driven inter-state migration. I only observe the state of residence of the woman at the time of the survey, which could have changed as a consequence of the divorce reform. For instance, women might have moved to reform states in order to benefit from easy divorce[29]. If these women are more (less) likely to experience abuse, the estimates will be upward (downward) biased. Migratory divorce is, however, not expected to be of concern due to two reasons. First, only 32 couples have divorced after unilateral divorce was introduced. Second, in the case of my main sample (i.e. married women at the time of the survey), migratory divorce is unlikely to have occurred, since it only includes women who are residing with their husbands[30].

An additional condition for unilateral divorce to be a valid natural experiment is that the adoption of this reform has been exogenous to the evolution of IPV. Section 3.6 will show that this seems to be, indeed, the case.

The key issue in estimating policy impacts is the construction of a valid control group, which will be used to estimate the unobserved counterfactual. In order for the DiD framework to be valid, the control group should follow a trend in IPV similar to the one that the treatment group would have experienced in the absence of the policy. This is called the parallel trend assumption, which is the crucial identifying assumption in any DiD setting. There is no formal way of testing for this assumption, but the usual approach has been to visually examine the pre-treatment trends of both groups. If they follow a similar trend, this provides support for the assumption.

A natural control group would be to choose all non-reform states (i.e. other 30 states). My preferred control group is, however, limited to 9 of them[31]. The reason is that I can

[28]Given that my main sample is restricted to women who are married at the time of the survey, the fact that there is a one year of marriage requirement in Mexico City is irrelevant for defining the sample. This will be taken into account when including divorced/separated women.

[29]Spouses can divorce in the state where they set their residence, regardless of where they married.

[30]Women who migrate for divorce purposes are unlikely to be residing with their husbands, since otherwise they could have filed for a mutual consent divorce in their state of origin.

[31]I could have also chosen cohabiting women in reform states as the control group, as done in Brassiolo (2016). However, this does not seem to be an appropriate control group for my sample. The reason is

confidently inspect the parallel trend assumption for 10 states only, since the 2003 sample is only representative in 11 out of 32 states (1 reform-Hidalgo- and 10 non-reform[32] states; see column 8 of table B1)[33]. From these 10 non-reform states, I further exclude one (Nuevo Leon), since, after checking the evolution of IPV during the pre-treatment period, it shows a path markedly different to the one experienced by the reform states. Thus, my final preferred set of states consists of 2 treatment and 9 control states.

Figure 3.3 shows the trends of treatment and control groups between 2003 and 2011 for the four types of IPV[34]. The pre-treatment trends of both groups seem to have followed a similar path in the four types of IPV, which provides confidence for the parallel trend assumption. Section 3.6 will further examine the validity of this assumption by conducting two falsification tests.

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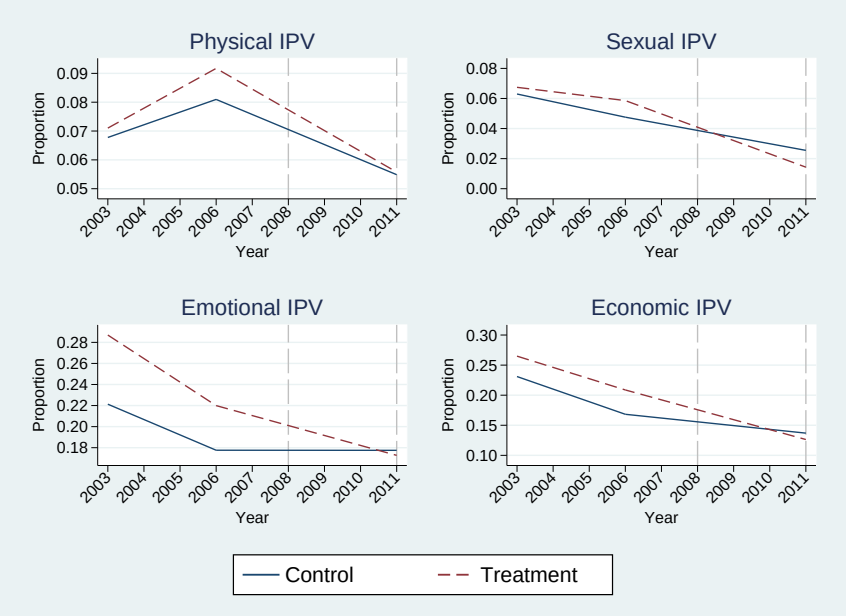
that I do not find support for the satisfaction of the parallel trend assumption both graphically and by conducting the two falsification tests explained later. Moreover, the estimates are extremely sensitive to the covariates included and the robustness checks do not always confirm the baseline estimates.

[32]Baja California, Coahuila, Chihuahua, Nuevo Leon, Sonora, Zacatecas, Michoacán, Chiapas, Quintana Roo and Yucatán.

[33]As a robustness check, I consider all 30 non-reform states as the control group.

[34]The treatment group in 2003 includes Mexico City, but it should be interpreted carefully, since the sample is not representative for this state. In order to diminish concerns in this regard, I have applied the survey sampling weights.

Figure 3.3: IPV trend by treatment status



Notes: The vertical axes refer to the proportion of women experiencing IPV. The vertical lines refer to the year unilateral divorce was introduced (2008 in Mexico City and 2011 in Hidalgo). Sampling weights are applied.

A potential threat to the validity of the parallel trend assumption refers to the adoption of reforms during my time span other than unilateral divorce that could have had a differential impact on women living in reform and non-reform states. I outline four possibilities. First, three states part of my control group[35] introduced the ground for divorce based on domestic violence in 2004 (see column 5 of table B1 for more details). Second, since the 1990s, all states have introduced changes to their Penal Codes with the objective of recognising domestic violence as a criminal offence. However, only one state in my preferred sample has done so during my time span[36] (see column 6 of table B1). The trends shown in figure 3.3 are not affected if I exclude those states that have changed their divorce or criminal legislations. Moreover, to test for the sensitivity of my estimates to these reforms, section 3.6 will re-estimate equation 3.1 controlling for them.

Third, the Congress of the Union decreed the *Ley General de Acceso de las Mujeres a una Vida Libre de Violencia* (General Law on Women's Access to a Life Free of Violence)

[35]Baja California, Chiapas and Quintana Roo.
[36]Quintana Roo.

in 2007[37], which is the current normative framework about violence against women at the national level. This General Law constitutes the basic reference framework under which each state has to frame specific Laws, as well as modify the Civil and Criminal Codes. Column 7 of table B1 provides the specific date in which each state approved the reform. All of them did it between 2006 and 2011, which suggests that both treatment and control groups might have been affected similarly. Even though, one cannot rule out that any observed change in IPV might be, in part, capturing the impact of this other law.

A final reform that could represent a threat to identification is the decriminalisation of elective abortion in the first 12 weeks of pregnancy in Mexico City, which came into force in April 2007. This could have affected IPV in either direction. This type of abortion is performed free of charge at any of the health clinics and hospitals part of the Ministry of Health for women residents in Mexico City. In addition, non-residents can abort for free at any of the health clinics (four in total), while in the hospitals they need to pay a sliding-scale fee, which depends on their socio-economic status. Moreover, some organisations offer financial support for women traveling from other states of Mexico (including a stipend for covering the travel costs). Even when financial help for women who cannot afford to abort in Mexico City exists, mis-information might make them less likely to benefit from the reform as compared to women without financial constraints. If this is the case, women living in treatment and control states would have not benefited similarly from the reform. Furthermore, in response to the abortion reform in Mexico City, several other states have amended their Constitutions to protect the right to life from conception or fertilisation. A total of 16 have done so since 2007 and all of them were between 2008 and 2009. As a robustness check, I will control for whether the woman is likely to have benefited from the reform in Mexico City and whether the state has introduced regressive constitutional changes in terms of abortion.

In addition to all these reforms, there might still be unobserved factors that have affected treatment and control groups differently. To further reduce this concern, in

[37]Published in the *Diario Oficial de la Federación* on 1 February 2007. See text in `http://www.diputados.gob.mx/LeyesBiblio/pdf/LGAMVLV_171215.pdf`.

section 3.6 I will, for instance, conduct two falsification tests; control for state time-varying covariates, such as the general level of violence and the economic conditions in the state; and interact all covariates with the $Post_t$ indicator in order to control for different trends in observable characteristics between women residing in reform and non-reform states.

3.5 Data and descriptive statistics

ENDIREH survey and sample

ENDIREH is a national (urban and rural) and state level representative survey[38], which collects data on independent cross-sectional samples. In 2003, the target population were women aged 15 or older with a partner residing in the household. In 2006 and 2011, this population was expanded to also include ever married or cohabiting (divorced, separated or widowed), in a relationship (never married or cohabiting), and single women, as well as those married or cohabiting not residing with their partners. A total of 34,184, 133,398 and 152,636 women were interviewed in 2003, 2006 and 2011, respectively. My main sample is comprised of married women living with their husbands, which represent 82% of the ENDIREH sample in 2003, 49% in 2006 and 43% in 2011[39]. Of these, I exclude women not living in treatment and control states, and those with missing values in any of the variables[40], which reduces the final sample to 55,593 women (16,137 in 2003, 19,463 in 2006 and 19,993 in 2011).

ENDIREH data were collected through direct interviews conducted by trained women between 20$^{\text{th}}$ October and 14$^{\text{th}}$ November of 2003, 9$^{\text{th}}$ October and 3$^{\text{rd}}$ November of 2006, and 3$^{\text{rd}}$ October and 11$^{\text{th}}$ November of 2011[41]. Moreover, interviews were conducted in private and participants were guaranteed confidentiality, which reduces concerns of under-reporting (Ellsberg et al., 2001).

[38] As mentioned earlier, it is representative in all states in 2006 and 2011, but only in 11 in 2003.

[39] In 2006 and 2011, cohabiting women represent 13% of the sample, divorced 2%, separated 7%, widowed 7%, and in a relationship or single 26%.

[40] I decide to do pairwise deletion due to the small number of missing values once I remove those corresponding to the dependent variable, namely 2% of the sample.

[41] See INEGI (2003, 2006, 2011) for a detailed explanation of the methodology.

IPV

ENDIREH provides information on whether the woman has experienced 29 violent items[42], which I group into four categories of IPV, namely physical and serious threats, sexual, emotional and economic. I group serious threats together with physical violence because they can be considered to be similar in terms of their severity. This is consistent with the classification of physical IPV used in previous studies (e.g. Stevenson and Wolfers (2006) and La Mattina (2017)). For the rest of the items, the classification follows the one suggested by ENDIREH. From the 29 violent events, I exclude one, namely 'has your partner stopped talking to you?', since this question can be interpreted with a large degree of subjectivity. Table B2 in the Appendix presents the prevalence of each violent item in treatment and control groups in 2003, 2006 and 2011.

For each of the four categories of IPV, I construct a dichotomous variable equal to one if the woman has experienced any violent item in the 12 months prior to when the survey was conducted and zero otherwise. The fact that the questionnaire includes a broad range of questions regarding each of the four types of violence, further reduces concerns of under-reporting (Ellsberg et al., 2001). Panel A of table 3.1 reports the prevalence of these four forms of IPV in treatment and control groups in 2003, 2006 and 2011. In general, emotional IPV is the most common, followed by economic, physical and sexual, respectively. Moreover, with the exception of physical abuse between 2003 and 2006, there has been a decline in IPV over time.

[42] 30 violent items in 2006 and 2011, but only 29 in 2003. In order to ensure comparability across years, I restrict them to 29.

Table 3.1: Descriptive statistics

	2003		2006		2011	
	T	C	T	C	T	C
Panel A: Prevalence of IPV						
Physical IPV	0.071	0.068	0.092	0.081	0.056	0.055
Sexual IPV	0.067	0.063	0.059	0.048	0.014	0.026
Emotional IPV	0.287	0.221	0.220	0.178	0.173	0.177
Economic IPV	0.265	0.231	0.209	0.168	0.126	0.137
Panel B: Covariates						
Age woman	45.200	41.373	45.012	42.940	46.565	44.141
Age man	48.602	44.685	48.161	46.189	49.680	47.265
Indigenous woman	0.072	0.099	0.070	0.104	0.044	0.096
Indigenous man	0.053	0.105	0.071	0.111	0.047	0.103
<Primary education woman	0.069	0.105	0.065	0.119	0.048	0.085
Primary education woman	0.329	0.445	0.307	0.401	0.250	0.364
Secondary education woman	0.458	0.358	0.465	0.373	0.495	0.425
Higher education woman	0.144	0.093	0.163	0.107	0.207	0.126
<Primary education man	0.041	0.102	0.045	0.108	0.038	0.083
Primary education man	0.333	0.412	0.278	0.379	0.227	0.361
Secondary education man	0.360	0.340	0.443	0.363	0.464	0.396
Higher education man	0.266	0.146	0.234	0.150	0.270	0.160
Violence in childhood	0.159	0.120	0.442	0.386	0.408	0.410
Length relationship	23.436	20.971	23.327	22.462	24.649	23.384
Number young children	0.328	0.471	0.301	0.412	0.132	0.186
Urban residence	0.922	0.774	0.888	0.757	0.895	0.759
SES low	0.242	0.456	0.237	0.397	0.208	0.395
SES middle	0.515	0.371	0.453	0.401	0.419	0.399
SES high	0.243	0.173	0.310	0.202	0.373	0.206
Observations	1,618	14,519	3,285	16,178	3,489	16,504

Notes: 'T' stands for treatment and 'C' for control. Sampling weights are applied.

Covariates

ENDIREH also contains information on a rich set of individual, couple and household characteristics. I specifically control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence and a Socio-Economic Status (SES) index[43] (see details in the Appendix).

Panel B of table 3.1 reports the mean value of all the covariates in treatment and

[43]I do not control for woman's employment status because it is likely to be affected by the divorce reform (Bargain et al., 2012), as well as by IPV (Tolman and Wang, 2005).

control groups in 2003, 2006 and 2011. Women living in reform states are older (as are their spouse), less likely to be indigenous (likewise for their partner), more likely to achieve a higher educational level (also their spouse), to have experienced violence in their childhood, been in the relationship for a longer time, have a lower number of young children, live in urban areas and have a high SES index. The difference in means between treatment and control groups is significant in most of the cases, even (although in relatively less) when I estimate within-state differences, which indicates that controlling for these characteristics is important.

3.6 Results

Baseline results

Table 3.2 reports the DiD estimate associated with equation 3.1. Column 1 only controls for state and year fixed effects, while columns 2, 3 and 4 add individual, couple and household level covariates, respectively. Taking into consideration the binary nature of the dependent variable, column 5 shows the marginal effects from estimating a Probit model. Finally, column 6 reports the prevalence of IPV in the treatment group during the pre-reform period, while column 7 the prevalence of IPV in the entire sample.

Specification 1 indicates that sexual, emotional and economic IPV have significantly (at the 1% level) decreased in reform states in comparison with non-reform states after the reduction in the cost of divorce. Adding the covariates in subsequent models reduces the magnitude of the coefficients, but the sign and significance remains unchanged. Likewise, the marginal effects are similar to the OLS estimates, although their magnitude is smaller. My preferred specification controls for the full set of covariates (model 4). According to it, the reduction in IPV has been of 1.7, 4.9 and 4.3 percentage points for sexual, emotional and economic IPV, respectively. Comparing these figures to the prevalence of IPV in the treatment group prior to the divorce reform (column 6), they represent a 30%, 23% and 20% decrease in violence, respectively. The fact that sexual IPV represents a larger

decline than emotional and economic abuse is consistent with previous empirical findings (Brassiolo, 2016). Regarding physical IPV, the coefficient of interest is negative, but insignificant and very close to zero across all specifications.

Table 3.2: Effect of easier divorce on IPV – Main specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	LPM				Probit	Mean (pre/treat)	Mean (all)
Physical	-0.007	-0.003	-0.004	-0.003	-0.001	0.081	0.068
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)		
Sexual	-0.019***	-0.017***	-0.017***	-0.017***	-0.013***	0.056	0.042
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)		
Emotional	-0.058***	-0.050***	-0.051***	-0.049***	-0.038***	0.213	0.192
	(0.010)	(0.007)	(0.007)	(0.007)	(0.006)		
Economic	-0.048***	-0.044***	-0.044***	-0.043***	-0.034***	0.217	0.182
	(0.009)	(0.008)	(0.008)	(0.007)	(0.005)		
State/Year FE	Yes	Yes	Yes	Yes	Yes		
Individual	No	Yes	Yes	Yes	Yes		
Couple	No	No	Yes	Yes	Yes		
Household	No	No	No	Yes	Yes		
Observations	55,593	55,593	55,593	55,593	55,593		

Notes: OLS estimates (columns 1-4) and marginal effects (column 5) associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Mean (pre/treat)' refers to the prevalence of IPV in the treatment group before the divorce reform (i.e. average 2003-2006). 'Mean (all)' refers to the prevalence of IPV in the entire sample. 'FE' stands for fixed effects. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. Individual covariates include both partners' age, both partners' indigenous background, both partners' educational attainment and woman's experience of violence in her childhood. Couple covariates include length of the relationship and number of young children. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

As mentioned earlier, by restricting the sample to marriages that remain intact after the reform, the estimates might be biased due to sample selection. In order to diminish this concern and shed some light on the two potential channels that economists have proposed to explain the effect of easier divorce on IPV, I now expand my sample to include women who were married at the time of the reform, regardless of their marital status at the time of the survey (i.e. married, divorced or separated)[44]. This approach reduces the sample to

[44]In the case of Mexico City, the definition of the treatment group for divorced and separated women accounts for the fact that there is a one-year marriage requirement.

Table 3.3: Effect of easier divorce on IPV – Expanded sample

	(1)	(2)	(3)	(4)	(5)
	LPM				Probit
Panel A: Married women					
Physical	-0.010	-0.005	-0.006	-0.005	-0.002
	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)
Sexual	-0.022***	-0.020***	-0.020***	-0.019***	-0.018***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Emotional	-0.047***	-0.038***	-0.039***	-0.038***	-0.037***
	(0.009)	(0.008)	(0.008)	(0.008)	(0.010)
Economic	-0.051***	-0.044***	-0.045***	-0.043***	-0.044***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Observations	39,456	39,456	39,456	39,456	39,456
Panel B: Married+Divorced women					
Physical	-0.010	-0.006	-0.006	-0.005	-0.002
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Sexual	-0.022***	-0.020***	-0.020***	-0.019***	-0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Emotional	-0.046***	-0.037***	-0.038***	-0.036***	-0.036***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.010)
Economic	-0.050***	-0.043***	-0.043***	-0.042***	-0.042***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.009)
Observations	39,782	39,782	39,782	39,782	39,782
Panel C: Married+Divorced+Separated women					
Physical	-0.008	-0.004	-0.004	-0.003	-0.001
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
Sexual	-0.023***	-0.021***	-0.021***	-0.021***	-0.020***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Emotional	-0.047***	-0.038***	-0.038***	-0.037***	-0.037***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Economic	-0.051***	-0.044***	-0.045***	-0.043***	-0.044***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Observations	41,598	41,598	41,598	41,598	41,598
State/Year FE	Yes	Yes	Yes	Yes	Yes
Individual	No	Yes	Yes	Yes	Yes
Couple	No	No	Yes	Yes	Yes
Household	No	No	No	Yes	Yes

Notes: OLS estimates (columns 1-4) and marginal effects (column 5) associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'FE' stands for fixed effects. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey (panel A), continue to be married or have divorced at the time of the survey (panel B) and continue to be married, or have divorced or separated at the time of the survey (panel C). The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey (for all married women and for divorced/separated in 2011) or since the couple split (for divorced/separated women in 2006). Individual covariates include woman's age, woman's indigenous background, woman's educational attainment and woman's experience of violence in her childhood. Couple covariates include number of young children. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

years 2006 and 2011, since no information on divorced and separated women is available for 2003. However, the main limitation of including these two additional groups of women refers to the definition of IPV. In 2006, IPV refers to violence experienced since the couple split, whereas in 2011 to violence experienced in the year before the survey, regardless of whether it has been inflicted during or after the couple split.

Table 3.3 reports the estimates of interest[45]. Panel A only includes intact marriages excluding the year 2003 and not controlling for the partner's characteristics[46]. The estimates confirm the findings in table 3.2. Panel B expands the sample to include women who have divorced after the reform, while panel C also includes those who have separated. Separated women could have been either married or cohabiting at the time of the reform and this cannot be disentangled with the available data[47]. The estimates reported in panels B and C are almost identical to those in panel A. According to divorce threat models, this suggests that the decrease in IPV is likely to be driven by a redistribution of bargaining power towards the woman, rather than by a change in divorce rates, which is in line with the findings in Brassiolo (2016). These results also suggest that, by restricting the sample to marriages that remain intact after the reform, I would be capturing most of the effect of easier access to divorce on IPV.

Further support for this bargaining power channel will be provided in section 3.7, where I find that the bargaining power (proxied by their contribution to decision-making in the household) of women living in reform states, as compared to those living in non-reform states, has significantly increased following the reduction in the cost of divorce.

Even when the divorce channel (i.e. an increase in the propensity that abused women divorce) does not seem to be explaining the decline in IPV, I further examine this mechanism by estimating the impact of easier divorce on an indicator of whether the woman is divorced. To do so, I use the whole sample of women provided by ENDIREH (i.e. married,

[45]I do not control for the length of the relationship because it is likely to be endogenous when including divorced and separated women.

[46]I do not control for the partner's characteristics because this information is not available for women not residing with their partners (most of the divorced and separated ones).

[47]I can disentangle this for 2006, when cross-tabulations show that most women who were separated had been married before.

cohabiting, divorced, separated, widowed, in a relationship and single). This exercise will shed some light on whether the proportion of women who are divorced has risen after the reform, which is a necessary condition for this channel to be in place. Table B3 in the Appendix reports the results. I find that in treatment, as compared to control, states the proportion of women who are divorced has significantly increased after the reform, but only at the 10% level. Moreover, the magnitude of the estimates is low in economic terms, since it only represents 4-5% of the average proportion of divorced women in the treatment group during the pre-reform period (0.017).

Robustness checks

In this section, I test for the validity of the DiD framework, as well as for the sensitiveness of my estimates to controlling for other reforms, including other time-varying state level covariates and employing alternative control groups. I also compute the standard errors using the Wild cluster bootstrap-t procedure and examine whether my findings reflect changes in the woman's reporting behaviour rather than in the prevalence of IPV.

Exogeneity of the timing of unilateral reform

I first test whether the introduction of unilateral divorce in Mexico City and Hidalgo was exogenous to the evolution of IPV for the group of married women. To examine this, I first compute the weighted average value of each outcome and covariate by state and year. I then regress an indicator of whether the state has introduced unilateral divorce (i.e. equal to one for Mexico City and Hidalgo) on the average prevalence of IPV in the pre-reform periods (i.e. 2003 and 2006). If higher (lower) prevalence led to the introduction of unilateral divorce, I would expect to see a significant positive (negative) coefficient. Table B4 in the Appendix presents the results. Columns 1, 3, 5 and 7 do not control for any covariate, while columns 2, 4, 6 and 8 control for the full set of them. As can be seen, the prevalence of IPV in the pre-reform period is not significantly associated with the subsequent adoption of unilateral divorce. Moreover, none of the covariates

are significantly associated with the timing of the reform. This provides support for the validity of unilateral divorce as a natural experiment.

Falsification tests

I next examine the validity of the parallel trend assumption. Figure 3.3 in section 3.4 provided support for this assumption by showing that the four types of IPV had followed a similar trend in both treatment and control groups during the pre-reform period. In order to further test for the satisfaction of this assumption, I conduct two falsification tests. First, restricting the sample to the pre-reform period, I re-estimate the DiD model assuming that unilateral divorce was introduced at some point between 2003 and 2006. Thus, 2003 is the pre-treatment period, while 2006 the post-treatment one. Since this 'placebo treatment' precedes the divorce reform, I would expect the DiD coefficient to be close to zero and insignificant. Panel A of table 3.4 presents the results. Column 1 reproduces the baseline estimates from table 3.2 for comparison purposes, while columns 2-6 report the estimates from the falsification test. The coefficients for the four types of IPV are insignificant and close to zero, regardless of whether I control for the covariates or estimate a probit model.

The second falsification test is based on estimating the effect of the divorce reform on a type of violence against women different to IPV, which I call public abuse, inflicted by an unknown person. This type of abuse should not be affected by the reform. I exclude violence inflicted by a known person because this could be correlated with the woman's marital status, as well as IPV. Information on public abuse is only available for 2006 and 2011, which explains the smaller number of observations. It refers to abuse experienced at any point in life by women in several settings including work, school, streets, public transport, parties and home[48]. Results are shown in panel B of table 3.4. As expected,

[48]The violent items refer to having been humiliated, ignored for being a woman, been physically assaulted, received insinuations or proposals for having sex in exchange for something, experienced reprisals due to the negative to these proposals, been touched without permission, been forced to have sex, been forced to have sex in exchange for money, experienced fear of being sexually assaulted or abused, and received rude or offensive saucy remarks about the body or with sexual connotation. The last three were asked for all settings in 2011, but only for settings other than work and school in 2006. Moreover, for

the DiD coefficients are insignificant and close to zero.

Table 3.4: Effect of easier divorce on IPV/Public abuse – Falsification tests

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Falsification test				
	LPM	LPM				Probit
Panel A: Placebo DiD						
Physical IPV	-0.003	0.007	0.003	0.003	0.003	0.003
	(0.007)	(0.005)	(0.003)	(0.003)	(0.004)	(0.005)
Sexual IPV	-0.017***	0.006	0.004	0.004	0.004	0.007
	(0.003)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)
Emotional IPV	-0.049***	-0.022	-0.028	-0.028	-0.026	-0.016
	(0.007)	(0.018)	(0.019)	(0.019)	(0.018)	(0.014)
Economic IPV	-0.043***	0.006	-0.003	-0.003	-0.002	0.005
	(0.007)	(0.015)	(0.017)	(0.017)	(0.017)	(0.015)
Observations	55,593	35,600	35,600	35,600	35,600	35,600
Panel B: Effect of unilateral divorce on public abuse						
Public abuse		-0.023	-0.019	-0.018	-0.020	-0.007
		(0.025)	(0.021)	(0.020)	(0.021)	(0.015)
Observations	39,425	39,425	39,425	39,425	39,425	
State/Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual	Yes	No	Yes	Yes	Yes	Yes
Couple	Yes	No	No	Yes	Yes	Yes
Household	Yes	No	No	No	Yes	Yes

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'FE' stands for fixed effects. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The sample in panel A is restricted to years 2003 and 2006, while the sample in panel B to years 2006 and 2011. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey (panel A) and an indicator of whether the woman has experienced public abuse at any point in her life (panel B). Individual covariates include both partners' age, both partners' indigenous background, both partners' educational attainment and woman's experience of violence in her childhood. Couple covariates include length of the relationship and number of young children. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

Overall, the results from these two falsification tests provide support for the parallel trend assumption. First, they indicate that the decline in IPV is not likely to be driven by an alternative phenomenon that predated the divorce change. Second, they suggest that changes in IPV do not seem to be driven by systematic unobserved differences between treatment and control groups.

abuse at work in 2006, it refers to violence experienced during the year before the survey.

Controlling for other covariates

The next set of robustness checks consists of controlling for covariates (including other reforms) that could potentially have a differential impact on the IPV trends of treatment and control groups. Section 3.4 reviewed three main potential confounding reforms, namely the introduction of the divorce cause of domestic violence, the criminalisation of domestic violence in the Penal Code and the decriminalisation of abortion in Mexico City. Regarding the first two, three states have modified their divorce (Baja California, Chiapas and Quintana Roo) and criminal (Quintana Roo) legislations and all of them did it between 2003 and 2006. To examine the sensitivity of my results to these changes, I include an indicator of whether the state has adopted any legislation modification by the time of the survey. Column 2 of table 3.5 presents the results. They show that the magnitude of the effect is slightly smaller than that reported in column 1 for all types of IPV, but the main conclusions remain unchanged.

Regarding the decriminalisation of abortion in Mexico City, I control for whether the woman is likely to benefit from it (column 3). In particular, I create a dichotomous variable equal to one if a woman aged 15-44[49] lives in Mexico City or if she lives in any other state, but her dwelling is classified as having a middle or high SES; and zero otherwise. One would expect that women living in low SES dwellings would be unlikely to afford the costs associated with aborting in Mexico City. The inclusion of this covariate leaves the coefficients of interest largely unaffected. Column 4 controls for whether the state has introduced constitutional changes to protect the right to life. The effect is now smaller in magnitude, but the main conclusions remain unchanged.

Model 5 controls for two other time-varying state level covariates in order to further diminish concerns of omitted variables. Specifically, it controls for the male's homicide rate and the male's unemployment rate (see details of their construction in the Appendix). I control for the homicide rate as a proxy for the general level of violence. Since 2007, some

[49]Women below 45 are more likely to be in reproductive age.

regions of the country have experienced a large increase in violence[50]. It could be that IPV is higher in these states due to a greater tolerance for it. I exclude female homicides, since these would include intimate partner homicides, which previous studies have found to be affected by the reduction in the cost of divorce (Stevenson and Wolfers, 2006). The unemployment rate serves as a proxy for the macroeconomic trend in the state. As in the previous case, I only control for the male's unemployment rate. Results in model 5 show that the estimates of interest remain largely unaffected.

Table 3.5: Effect of easier divorce on IPV – Robustness checks: Additional covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Divorce+ Criminal	Abortion MC	Abortion Const.	State covariates	Covariates × Post	Reform states
Physical	-0.003	-0.002	-0.002	-0.005	-0.002	-0.004	-0.003
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Sexual	-0.017***	-0.016***	-0.017***	-0.012***	-0.017***	-0.020***	-0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Emotional	-0.049***	-0.047***	-0.049***	-0.047***	-0.049***	-0.050***	-0.049***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.011)	(0.007)
Economic	-0.043***	-0.042***	-0.042***	-0.034***	-0.045***	-0.045***	-0.043***
	(0.007)	(0.006)	(0.007)	(0.004)	(0.007)	(0.007)	(0.007)
Observations	55,593	55,593	55,593	55,593	55,593	55,593	55,593

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. Column 1 reproduces the baseline estimates from table 3.2, column 2 controls for whether the state has modified the divorce and/or criminal legislations with regard to domestic violence, column 3 controls for whether the woman is likely to benefit from the decriminalisation of abortion in Mexico City, column 4 controls for whether the state has introduction constitutional changes to protect the right to life from conception or fertilisation, column 5 controls for male's homicide and unemployment rates in the state, columns 6 controls for the interaction between the covariates and the post-reform indicator, and column 7 includes an indicator of whether the state has introduced unilateral divorce after 2011. 'MC' stands for Mexico City and 'Const' for constitutional. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

Column 6 adds interaction terms between all covariates and the post-treatment indicator $Post_t$. The objective is to control for different trends in observable characteristics, which could otherwise be driving my findings. Adding these covariates slightly increases the magnitude of the effect of interest, but the estimates point in the same direction.

[50]Previous studies have found this to be closely related to the 'war on drugs' initiated by the former President Felipe Calderón (Dell, 2015).

As a final robustness check, column 7 includes an indicator of whether the state has introduced unilateral divorce after 2011. Only three states in my control group have done so (Coahuila, Quintana Roo and Yucatán). The reason for this test is that these states might have unobserved factors that make them more prone to adopt unilateral divorce. If these factors have changed over time (e.g. gender norms), they could have contaminated my results. Including this variable does not affect the estimates of interest, which remain almost identical to those reported in column 1.

Additional robustness checks

I first consider alternative control groups to test whether my results are sensitive to the restriction of the number of states. Column 2 of table B5 in the Appendix reports the results when the control group is formed by the 30 non-reform states. In column 3 I restrict this control group to states that have not reformed their divorce and criminal legislations. In addition to this restriction, column 4 excludes women who are not likely to have benefited from the decriminalisation of abortion in Mexico City, column 5 removes states that have introduced constitutional changes in response to Mexico City's abortion reform and column 6 excludes late reform states. Although in some of the cases the estimates show that the effect of easier divorce is now smaller or slightly larger in magnitude, the coefficients lead to the same conclusions than those obtained from column 1.

One concern of my survey is that the variable 'length of the marriage' is based on the question 'How old were you when you married or started living with your partner?'. Thus, the age reported is not necessarily the age at marriage, but the age at which the couple started living together. Consequently, the computed length of the marriage is not precisely calculated. As a robustness check, I restrict the sample to women married for at least 10 years at the time of the reform, i.e. at least 13 years at the time of the survey living in Mexico City and 11 years in Hidalgo, since these women are more likely to actually be 'married'[51]. Specification 7 shows the estimates of interest, which confirm

[51]The sample in the control group is restricted to women who have been married for at least 13 years.

the baseline findings.

Wild cluster bootstrapped standard errors

Using cluster-robust standard errors when the number of clusters is small is likely to underestimate the standard errors (see footnote 26). One commonly used method to deal with this limitation is to employ the Wild cluster bootstrap-t procedure described in Cameron et al. (2008). Table B6 in the Appendix re-estimates the baseline results using this method. As can be seen, the Wild cluster bootstrapped standard errors are larger than the cluster-robust ones reported in table 3.2, but the baseline findings are confirmed.

Reporting behaviour

A final concern of my estimates is that they could be driven by a differential propensity to report IPV of women residing in treatment and control states induced by the reform. To examine this, I estimate the effect of the reform on woman's reporting behaviour. ENDIREH survey provides information on whether the woman reports the violent incident to the police, Public Ministry or another authority. I construct an indicator of whether she reports it[52].

A woman's reporting behaviour is only observed for abused women, which can introduce sample selection bias if the probability that men use IPV is non-randomly distributed. For instance, men who think that their wives would report IPV upon abuse might be less likely to use it. To correct for this, I use Heckman sample selection model. For doing so, I need a variable that affects the man's decision to use IPV, but not the woman's probability of reporting it directly. A candidate for this role is the man's experience of violence in his childhood. Previous literature has shown that men are more likely to inflict violence if they have experienced it in the past (Gover et al., 2008; Kwong et al., 2003; Pollak, 2004). At the same time, there is no reason for expecting this variable to be associated with the woman's reporting behaviour through any channel other than

[52] 14% of women in my sample have reported IPV to the police, Public Ministry or another authority, but this drops to 9% when they do not experience physical IPV.

the IPV one. Using this variable, however, has the problem of having a large number of missing values (16%). Given this, I also estimate the baseline regression using this restricted sample, which provides very similar results to the ones reported in table 3.2 (see table B7 in the Appendix).

Table B8 presents the results. Column 2 reports the Probit estimate associated with the selection variable. It shows that a man's experience of violence in his childhood is significantly positively associated with a woman's experience of IPV as an adult. Column 1 presents the OLS estimate corresponding to an ordinary LPM model, while column 3 takes into account sample selection and reports the maximum likelihood estimate associated with the Heckman model. Regardless of the specification, the proportion of IPV cases reported to the police or any other authority has not significantly changed in treatment states relative to control ones after the reform. This is consistent with the fact that women rarely report IPV, regardless of the cost of divorce.

Comparison with previous studies

The findings so far suggest that IPV has decreased in treatment states, as compared to control ones, following easier divorce. This is in line with the prediction of divorce threat models. However, the significance and magnitude of the estimates vary across types of IPV, as well as compared to previous studies.

Focusing on physical IPV, while I find a negative, but insignificant effect of the divorce reform on this type of violence, both Stevenson and Wolfers (2006) and Brassiolo (2016) report a significant decrease. Their estimates indicate a decline of 4.8 and 0.6 percentage points (32% of the sample mean), respectively, which is larger than the 0.3 percentage point (4% of the sample mean) decrease in my case. Compared to Stevenson and Wolfers (2006, p. 281), this cannot be attributed to the definition of IPV, since I use a very similar one to them. However, this is not the case for Brassiolo (2016, p. 474).

In order to ensure comparability with this latter study, I construct an alternative

Table 3.6: Effect of easier divorce on IPV – Definition of IPV based on Brassiolo (2016)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Physical		Emotional		Economic	
	All (7 items)	Physical (5 items)	Emotional (2 items)	All (3 items)	All (5 items)	Economic (4 items)	Emotional (1 item)
Treat × Post	-0.019*	-0.005	-0.020***	-0.039***	-0.047***	-0.048***	-0.003
	(0.009)	(0.007)	(0.005)	(0.006)	(0.009)	(0.009)	(0.003)
Mean (all)	0.109	0.064	0.079	0.113	0.125	0.119	0.022
Observations	55,593	55,593	55,593	55,593	55,593	55,593	55,593

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Mean (all)' refers to the prevalence of IPV in the sample. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

measure similar to the one employed by him. He considers three items[53], which can be matched with seven of mine[54]; five of which I classify as physical IPV, while two as emotional abuse. Results are reported in columns 1-3 of table 3.6. Column 1 includes all seven violent items, column 2 only the five related to physical IPV, while column 3 the two related to emotional abuse. Using this alternative definition, physical violence has declined by 1.9 percentage points in reform states compared to non-reform ones after the reform, although only at the 10% significance level. This represents a 17% decrease with respect to the sample mean, which is below the value obtained by Brassiolo (2016) (and Stevenson and Wolfers (2006)). The reduction is, however, entirely driven by the items classified as emotional violence under my definition.

Regarding sexual IPV, my estimates show a significant decline in the prevalence of this type of violence, which is consistent with the findings in Brassiolo (2016). In terms of the magnitude of the effect, the baseline specification indicates a decline in sexual IPV of 1.7 percentage points (40% of the sample mean), which is very close to the 1.5 percentage

[53]He insults or threatens you, at times he frightens you, he pushes or hits you when he is angry.

[54]Has your husband... pushed you or pulled your hair?, kicked you?, beaten you with his hands or any object?, threatened you with a weapon?, threatened to kill you, himself or the children?, threatened to leave you, hurt you, take your children away or kick you out?, made you feel fear?.

point (41% of the sample mean) decline reported by Brassiolo (2016).

In the case of emotional IPV, I find a significant 4.9 percentage point decrease, which is more than double the 2.2 percentage point decrease reported by Brassiolo (2016). However, when looking at how much this represents over the sample mean, my estimate represents 25%, which is below the 30% found by him. Furthermore, when I restrict the definition of emotional IPV to be more closely related to that used by Brassiolo (2016, p. 474)[55], the DiD estimate decreases to 3.9 percentage points, although this represents 35% of the sample mean (see column 4 of table 3.6).

Regarding economic violence, this is to some extent comparable with what Brassiolo (2016) terms 'psychological abuse in the form of control'. He finds a negative, but insignificant, impact of the reform on this type of violence, while I find a significant negative one. Even when it is insignificant, the magnitude of the coefficient indicates a decrease of 30% of the sample mean, which is larger than the 24% found in my case. Following the exercise done for physical and emotional IPV, I examine whether the different results between both studies are sensitive to the definition of abuse used[56]. Results are reported in columns 5-8 of table 3.6, which confirm my baseline findings. Moreover, the magnitude of the effect is now larger than before (4.7 percentage points or 38% of the sample mean).

The findings so far highlight two main points. First, a reduction in the cost of divorce seems to have a decreasing effect on IPV. However, the significance and magnitude of this effect varies across forms of abuse, as well as compared to estimates from developed countries. In particular, I have found an insignificant and small effect of unilateral divorce on physical IPV, whereas a significant and large effect of this reform on sexual, emotional

[55]His definition includes the following items: He does not consider your needs; he tells you that you are not capable of anything without him; he says everything you do is wrong, that you are clumsy; he belittles or does not value your beliefs (religious, political, etc.); he does not value the work you do; he demeans you in front of your children. These six items can be compared to three of mine: Has your husband... ashamed, underestimated or humiliated you?; ignored or not shown you affection?; turned your children or relatives against you?.

[56]Brassiolo (2016) includes three violent items (he prevents you from seeing your family or relating to friends and neighbors, he takes the money your earn or does not give you what you need, he decides what you can and cannot do), which are matched with five of mine. I classify four of them as economic items (been stingy with the household expenses, even though he has money?, not given you the upkeep or threatened you to not giving it?, appropriated or taken money or possessions from you?, forbidden you to work or study?) and one as emotional (locked you in, forbidden you from going out or being visited?).

and economic IPV. In addition, the magnitude of the effect for physical and sexual IPV has been found to be smaller than that reported for developed countries. Conversely, when emotional and economic abuse have been defined similarly to Brassiolo (2016), the magnitude of the impact has been found to be larger than in Spain.

Second, the estimates might be sensitive to the definition of IPV used, which has been shown to occur for physical violence. This is, however, unlikely to explain the insignificant effect of the reform on physical IPV, since my results are not consistent with those in Stevenson and Wolfers (2006) employing a very similar definition. This insignificant impact is also unlikely to be explained by a non-response of physical IPV to changes in the spouses' outside option, as internal threat point models posit (Anderson and Eswaran, 2009; Lundberg and Pollak, 1993)[57], since other forms of abuse have experienced a decrease following the reform. Moreover, the insignificant effect does not seem to be hiding heterogeneous impacts of the reform by variables, such as education (see section 3.6), indigenous background, presence of young children, urban residence and SES index (see table B9 in the Appendix). This suggests that there might be other reasons behind my findings, which are examined in the next section.

Substitution effect across types of IPV

A plausible explanation for the insignificant impact of unilateral divorce on physical IPV is that it might be hiding a substitution effect across types of IPV. In order to examine this, I construct a set of indicators of whether the woman has experienced physical IPV with no associated sexual; emotional; economic; emotional and economic; and sexual, emotional and economic IPV. Results are reported in panel A of table 3.7. Panels B, C and D construct equivalent indicators for sexual, emotional and economic violence, respectively. The sample mean value (last row of column 5 in each panel) shows

[57]Internal threat point models argue that the threat of divorce might not be credible under certain circumstances, such as when the breakdown of the bargaining process arises over minor decisions or when divorce is not socially acceptable. In these cases, a more plausible threat scenario would be a non-cooperative outcome within the marriage. Consequently, changes in the spouses' outside options should have no impact on their bargaining positions.

that 1.3% of women report that physical IPV occurs alone (6.6% report physical IPV). The equivalent figures are 0.4% (4.1%) for sexual, 6.4% (18.9%) for emotional and 6.3% (17.9%) for economic abuse. This provides support for the widespread recognation that IPV manifests itself in multiple forms, which usually overlap (Mechanic et al., 2008).

The estimates indicate that, after the reform, physical IPV occurring alone or with no associated emotional and/or economic abuse has significantly increased in the treatment group relative to the control group. Focusing on column 5, the estimate indicates an increase of 0.7 percentage points, which represents a 87% increase with respect to the prevalence of IPV in the treatment group prior to the divorce reform. Interestingly, panel B shows that the decrease in sexual IPV observed in table 3.2 only holds when this type of abuse is not associated with physical violence. In the rest of the cases, the prevalence of sexual violence increases, although it is not always significant (0.3 percentage points or 75% of the prevalence of IPV in treatment states before the reform in model 5).

Panels C and D show very similar results for emotional and economic IPV. The significant decrease is only observed when these types of violence do not occur together with physical and/or sexual abuse. The decline in terms of percentage points has been of 2.4-3.7 and 1.7-3.2 for emotional and economic IPV, respectively, which is smaller than the one reported in table 3.2 (4.9 and 4.3 percentage points). Compared to the prevalence of IPV in the treatment group prior to the divorce reform, the decrease represents 19-26% and 12-20%, respectively.

Taking the results in tables 3.2 and 3.7 together, they suggest that making divorce easier might have led to a substitution of emotional and economic IPV for physical and sexual violence. These findings are not consistent with the classical prediction of divorce threat models, since they predict that *all* types of IPV will decline following a reduction in the cost of divorce. In contrast, they are consistent with a 'male backlash effect' explanation by which the reform has been perceived by the husband as a threat to his dominant position. They are also consistent with an explanation by which IPV is used to prevent women from divorcing.

Table 3.7: Effect of easier divorce on IPV – Substitution effects

	(1)	(2)	(3)	(4)	(5)
Panel A: Physical IPV with no associated...					
	Sexual	Emotional	Economic	Emo/Eco	Sex/Emo/Eco
Treat × Post	0.001	0.009**	0.008**	0.007*	0.007*
	(0.007)	(0.003)	(0.004)	(0.004)	(0.004)
Mean (pre/treat)	0.054	0.013	0.024	0.009	0.008
Mean (all)	0.048	0.018	0.026	0.014	0.013
Panel B: Sexual IPV with no associated...					
	Physical	Emotional	Economic	Emo/Eco	Phy/Emo/Eco
Treat × Post	-0.012***	0.001	0.003	0.003**	0.003**
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Mean (pre/treat)	0.030	0.009	0.011	0.004	0.004
Mean (all)	0.023	0.008	0.011	0.005	0.004
Panel C: Emotional IPV with no associated...					
	Physical	Sexual	Economic	Phy/Sex	Phy/Sex/Eco
Treat × Post	-0.037***	-0.031***	-0.008	-0.024***	-0.008
	(0.007)	(0.009)	(0.007)	(0.007)	(0.007)
Mean (pre/treat)	0.145	0.165	0.083	0.124	0.062
Mean (all)	0.142	0.159	0.082	0.127	0.065
Panel D: Economic IPV with no associated...					
	Physical	Sexual	Emotional	Phy/Sex	Phy/Sex/Emo
Treat × Post	-0.032***	-0.023***	-0.002	-0.017**	-0.001
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
Mean (pre/treat)	0.161	0.172	0.088	0.140	0.078
Mean (all)	0.140	0.151	0.071	0.125	0.064
Observations	55,593	55,593	55,593	55,593	55,593

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Phy' stands for physical, 'Sex' for sexual, 'Emo' for emotional and 'Eco' for economic. '/' refers to 'and' (i.e. Phy/Sex means Physical *and* sexual). 'Mean (pre/treat)' refers to the prevalence of IPV in the treatment group before the divorce reform (i.e. average 2003-2006). 'Mean (all)' refers to the prevalence of IPV in my sample. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

A remaining question is why 'male backlash effect' or 'divorce prevention' explanations are consistent with an increase in physical and sexual IPV, but not other forms of violence.

I provide two possible reasons. First, physical and sexual IPV are less common, and, as a result, they are more likely to have a greater impact on the wife's behaviour than emotional and economic abuse. Second, women usually consider physical and sexual IPV to be 'more serious' than emotional and economic abuse[58], even when the consequences of the latter two can be longer-lasting (Arias and Pape, 1999; Mechanic et al., 2008). Related to this, women tend to be more afraid of physical and sexual IPV than of emotional and economic abuse[59], which makes these types of violence more likely to be used to create an atmosphere of fear both during the marriage and after leaving it (Mullender, 1996; Radford and Harne, 2008). Together, these two reasons suggest that physical and sexual IPV might be more 'effective' than other types of violence, at least in the short-run, which would make men more likely to use them as an instrument to reassert their dominance and to prevent their wives from leaving the marriage. One might be wondering, however, that physical and sexual IPV are also more likely to push women beyond their threat point and, thus, lead them to divorce. This, however, does not seem to be very plausible in my sample, as analysed in section 3.6.

My findings provide support for the hypothesis that, in developing countries, the reduction in the cost of divorce would not necessarily decrease IPV, but it might lead to an increase of it if, for instance, the improvement in the woman's outside option is perceived as a threat to the man's dominant position. An increase in violence following an improvement in the woman's outside option has also been found in previous studies about Mexico looking at the effect of the CCT programme *Oportunidades* on IPV (Angelucci, 2008; Bobonis et al., 2013).

[58]In the survey, abused women are asked about whether they think that the violent act is very serious, serious or not serious. On average, physical and sexual violent items are ranked among the most serious, followed by economic and emotional ones, respectively.

[59]Abused women in 2006 and 2011 are asked about the reasons for not divorcing. 'Fear of what the husband could do to them or their children' is the answer provided in 4% of the cases when either physical or sexual IPV occur, whereas in 0% when they do not occur.

Heterogeneous effects

The findings in the previous section suggest that the reduction in the cost of divorce might have led to a substitution effect across types of IPV motivated by a 'male backlash effect' or a 'divorce prevention' strategy. If any of these motivations are in place, one would expect them to be driven by spouses who hold more 'traditional' views on gender roles (Overall et al., 2016). To examine whether this is the case, I proxy for views on gender roles using the level of education, which has been a proxy employed previously in the literature (Angelucci, 2008; Sullivan et al., 2014)[60].

Husband's educational attainment

To analyse whether the effect of the reform varies with the husband's education, I interact this variable with $Treat \times Post$[61], which provides the differential impact of the reform across levels of education. Results are reported in table 3.8. Columns 1, 2, 3 and 4 refer to physical, sexual, emotional and economic IPV defined as in the baseline case, whereas columns 5 and 6 to physical and sexual IPV occurring alone, respectively. Panel A reports the estimates assuming a homogeneous impact across women. Panel B presents the estimates associated with each educational level[62], while panel C the differential impact of the reform across educational groups.

[60]In the survey, the woman is directly asked about her views on gender roles. I use this information to check whether this is associated with her educational attainment. I find that 16% of women with less than primary education completed agree with the statement 'the man has the right to beat his wife', while this figure is only 1% for women with higher education completed. I do not use women's views on gender roles directly, since it is likely to be endogenous.

[61]I also include the corresponding lower order interactions terms.

[62]For women married to men with low education, the effect of the reform on IPV is given by $Treat \times Post$; for women married to men with intermediate education, by the sum of $Treat \times Post$ and $Treat \times Post \times Intermediate$; and for women married to men with high education, by the sum of $Treat \times Post$ and $Treat \times Post \times High$.

Table 3.8: Effect of easier divorce on IPV – Heterogeneous effects by husband's education

	(1)	(2)	(3)	(4)	(5)	(6)
	Physical	Sexual	Emotional	Economic	Physical alone	Sexual alone
Panel A: Overall effect (homogeneous)						
All women	-0.003	-0.017***	-0.049***	-0.043***	0.007*	0.003**
	(0.007)	(0.003)	(0.007)	(0.007)	(0.004)	(0.001)
Panel B: Overall effect (heterogeneous)						
Low	0.011	-0.012	-0.078	-0.068	0.071**	0.010***
	(0.055)	(0.015)	(0.074)	(0.059)	(0.023)	(0.002)
Intermediate	-0.009	-0.018***	-0.040***	-0.034***	0.008**	0.003
	(0.012)	(0.004)	(0.012)	(0.010)	(0.003)	(0.002)
High	0.011	-0.026***	-0.078***	-0.070***	-0.001	0.001
	(0.007)	(0.005)	(0.012)	(0.013)	(0.005)	(0.001)
Panel C: Differential effect						
Intermediate vs. Low	-0.020	-0.006	0.038	0.034	-0.063**	-0.007**
	(0.067)	(0.016)	(0.085)	(0.062)	(0.025)	(0.003)
High vs. Low	-0.000	-0.014	0.000	-0.002	-0.072**	-0.009***
	(0.061)	(0.018)	(0.079)	(0.068)	(0.026)	(0.003)
High vs. Intermediate	0.020*	-0.008	-0.038**	-0.036**	-0.009**	-0.002
	(0.010)	(0.006)	(0.013)	(0.016)	(0.004)	(0.002)
Observations	55,593	55,593	55,593	55,593	55,593	55,593

Notes: Panels A and B report the OLS estimates associated with the variable $Treat \times Post$. Panel C reports the OLS estimates associated with the variable $Treat \times Post$ interacted with the man's educational level. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Low' refers to less than primary education completed, 'Intermediate' to primary, secondary or vocational training completed, and 'High' to university education completed. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, woman's educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

As expected, the substitution effect is concentrated on women married to men with low education. For this group of women, emotional and economic abuse have experienced a large, although insignificant, decrease (columns 3 and 4). This has been accompanied by a significant increase in physical and sexual IPV occurring alone (columns 5 and 6). In particular, emotional and economic abuse have declined by 7.8 and 6.8 percentage points in treatment, relative to control, states following the reform; whereas physical and sexual

IPV have increased by 7.1 and 1.0 percentage points, respectively. Moreover, this increase is significantly larger than that experienced by women married to men with intermediate or high education. If physical and sexual IPV are defined as not being associated with emotional and/or economic abuse, results point in the same direction to those reported in columns 5-6 (see table B10 in the Appendix)[63].

Wife's educational attainment

Table 3.9 presents the results for the wife. Similar to the husband's case, women with low education hold the bulk of the substitution effect. In particular, columns 3 and 4 report a decline of 6.3 and 2.3 percentage points in emotional and economic IPV, whereas columns 5 and 6 show a significant and large increase in physical and sexual IPV (6.6 and 0.9 percentage points), respectively. This increase is significantly larger than that experienced by women in the middle and top of the education distribution. Table B11 in the Appendix presents the results using alternative definitions of physical and sexual IPV, which essentially confirm the findings. The pattern in table 3.9 is very similar to that observed in table 3.8. This suggests that the increase in violence might not only be driven by women holding a 'traditional' view on gender roles, but also by positive assortative mating in terms of views on gender roles. That is, if women with low education tend to marry men with low education[64], they would be marrying men who hold more 'traditional' views on gender roles and, thus, who are more likely to be violent.

[63] Also, considering physical IPV with no associated sexual violence leads to similar results than those reported in column 1. Same for sexual IPV with no associated physical violence in column 2; and emotional and economic abuse with no associated physical and/or sexual violence in columns 3 and 4, respectively.

[64] There is a large theoretical and empirical literature on assortative mating on education (Becker, 1973; Çelikaksoy et al., 2006). In my sample, 46% of women with low education are married to men of the same level of education. This number is 83% for women with intermediate education and 72% for those with high education.

Table 3.9: Effect of easier divorce on IPV – Heterogeneous effects by wife's education

	(1)	(2)	(3)	(4)	(5)	(6)
	Physical	Sexual	Emotional	Economic	Physical alone	Sexual alone
Panel A: Overall effect (homogeneous)						
All women	-0.003	-0.017***	-0.049***	-0.043***	0.007*	0.003**
	(0.007)	(0.003)	(0.007)	(0.007)	(0.004)	(0.001)
Panel B: Overall effect (heterogeneous)						
Low	0.047	0.022	-0.063***	-0.027	0.066***	0.009***
	(0.042)	(0.018)	(0.011)	(0.019)	(0.005)	(0.002)
Intermediate	-0.009	-0.021***	-0.059***	-0.051***	0.006*	0.003
	(0.011)	(0.004)	(0.012)	(0.011)	(0.003)	(0.002)
High	0.010	-0.023***	-0.019	-0.020	0.004	0.002
	(0.012)	(0.007)	(0.019)	(0.014)	(0.002)	(0.001)
Panel C: Differential effect						
Intermediate vs. Low	-0.056	-0.043**	0.004	-0.024	-0.060***	-0.006
	(0.053)	(0.018)	(0.016)	(0.027)	(0.006)	(0.004)
High vs. Low	-0.037	-0.045*	0.044*	0.007	-0.062***	-0.007**
	(0.046)	(0.024)	(0.021)	(0.021)	(0.006)	(0.003)
High vs. Intermediate	0.019	-0.002	0.040	0.031	-0.002	-0.001
	(0.016)	(0.008)	(0.022)	(0.020)	(0.002)	(0.002)
Observations	55,593	55,593	55,593	55,593	55,593	55,593

Notes: Panels A and B report the OLS estimates associated with the variable $Treat \times Post$. Panel C reports the OLS estimates associated with the variable $Treat \times Post$ interacted with the woman's educational level. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Low' refers to less than primary education completed, 'Intermediate' to primary, secondary or vocational training completed, and 'High' to university education completed. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, man's educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

3.7 The effect of easier divorce on woman's bargaining power

Divorce threat models posit that a reduction in the cost of divorce should redistribute power towards the spouse relatively more willing to divorce. To the best of my knowledge

this prediction has, however, not been tested in the empirical literature. The present section aims to fill this gap by using the woman's (absolute and relative) contribution to decision-making as a proxy for her bargaining power[65]. Examining the link between divorce laws and bargaining power is not only important by itself but also because divorce laws have been found to affect a number of outcomes of the bargaining process including IPV, woman's labour force participation and household production (see section 3.2 for references). In the specific case of IPV, divorce threat models predict that easier divorce should reduce IPV through an improvement in the woman's bargaining power. This prediction, however, ignores the possibility that the husband perceives his wife's improved bargaining power as a threat to his dominant position. If this is the case, violence could increase, as my results for physical and sexual IPV suggest.

In order to examine whether the divorce reform has had any impact on the intra-household distribution of power, I re-estimate equation 3.1, but considering as dependent variable the woman's contribution to decision-making. The survey asks women who (her alone, her partner alone, both together or other people[66]) makes most of the times eight decisions regarding whether she can work or study, go out of home, how to spend the household money, what the children can do, move house or town, when to have sexual relations, if contraception methods are used and who uses them[67].

I use these eight decisions to construct two set of indices. The first set captures the woman's absolute decision-making power, while the second one her relative say (see details in the Appendix). Moreover, for each of them, I construct three indices. First, an overall index that groups the eight decisions. Second, an index that groups the two decisions related to the woman's personal activities, which are decisions most of the times made by her alone (personal index)[68]. Following the terminology of household bargaining models, they can be considered to be her private goods and services. Third, an index that groups

[65]This has been a proxy used previously in the literature. See, for instance, Majlesi (2016).

[66]In less than 0.20% of the cases the decision is taken by other people.

[67]In 2003, the survey asked women about 13 decisions, whereas in 2006 and 2011 about 11. However, only 8 are comparable across waves.

[68]Whether she can work or study and whether she can go out of home.

the six decisions related to household activities, which are decisions most often taken by both partners together (household index)[69]. They can be interpreted as the household public goods and services. Table B12 in the Appendix provides some descriptive statistics. Focusing on the overall index for the treatment group in 2011, 34% of the decisions were made by the woman alone, 7% by her partner alone and 59% by both together. Since more decisions were taken by the woman alone than by her husband, the relative decision-making power index is positive. Comparing 2011 with previous years, the percentage of decisions made by the woman alone has been increasing over time, but this is entirely driven by those decisions related to her personal activities.

Table 3.10 presents the results. Columns 1-3 report the estimates associated with the woman's absolute decision-making power, whereas columns 4-6 the ones associated with her relative say. Columns 1 and 4 refer to the overall index, columns 2 and 5 to the personal index, and columns 3 and 6 to the household index. Focusing on the overall index, the absolute and relative decision-making power of women has significantly improved in treatment states relative to control ones after the reform. Comparing the magnitude of the coefficient with the average value of the index for the treatment group in the pre-reform period, this represents a 10% increase in column 1 and 24% in column 4. In both cases the significant increase is driven by the woman's personal index. Moreover, although insignificant, the introduction of unilateral divorce seems to have improved the woman's relative say about household decisions with an observed 10% increase (column 6).

[69]How to spend the household money, what the children can do, whether to move house or town, when to have sexual relations, if contraception methods are used and who uses them.

Table 3.10: Effect of easier divorce on woman's decision-making power

	(1)	(2)	(3)	(4)	(5)	(6)
	Absolute			Relative		
	Overall	Personal	Household	Overall	Personal	Household
Treat × Post	0.029*	0.094***	-0.006	0.045**	0.108***	0.011
	(0.015)	(0.029)	(0.007)	(0.015)	(0.029)	(0.007)
Mean	0.275	0.468	0.195	0.185	0.375	0.106
Observations	55,178	55,178	55,178	55,178	55,178	55,178

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sample weights are applied. The smaller number of observations compared to table 3.2 is due to the missing values in the variables used to construct the woman's decision-making power indices. 'Mean' refers to the mean value of the dependent variable in the treatment group before the divorce reform (i.e. average 2003-2006). The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an index of woman's absolute (columns 1-3) or relative (columns 4-6) decision-making power. In columns 1 and 4 it groups all the decisions (eight), in columns 2 and 5 those related to the woman's personal goods and services (two) and in columns 3 and 4 those related to the household public goods and services (five). All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

In short, the results presented in this section suggest that, following the reform, the bargaining power of women has significantly increased in treatment, as compared to control, states. This shows that easier access to divorce has benefited women relatively more than men, which has translated into a redistribution of power towards them. However, this has only occurred in decisions usually made by women alone and, as such, it only reflects a limited improvement in their bargaining position. Furthermore, in contrast with the prediction of divorce threat models, women's improved bargaining power is unlikely to serve as a channel for explaining the decrease in sexual, emotional and economic IPV. The reason is that this decline has been accompanied by an increase in physical and sexual IPV occurring alone or with no associated emotional and/or economic abuse, which seems to be consistent with 'male backlash effect' and 'divorce prevention' explanations. Moreover, the results in this section are also consistent with the possibility that the improvement in the woman's bargaining position serves as an additional channel (in addition to the reduction in the cost of divorce) through which men feel their dominant position threatened.

3.8 Conclusion

This paper has provided empirical evidence of the relationship between divorce laws and IPV in the context of a developing country. It has specifically estimated the causal effect of reducing the cost of divorce on male-to-female physical, sexual, emotional and economic IPV by exploiting the state-level variation in the timing of the introduction of unilateral divorce in Mexico.

My results have shown that sexual, emotional and economic IPV have significantly declined in reform states compared to non-reform ones following the reform. They have also shown a significant increase in physical and sexual IPV occurring alone or with no associated emotional and/or economic abuse. Taken together, these findings suggest that easier divorce might have led to a substitution of emotional and economic abuse for physical and sexual violence. This substitution effect has been found to be concentrated on wives and husbands with 'traditional' views on gender roles. My results are not in line with the classical prediction of divorce threat models, but seem consistent with 'male backlash effect' or 'divorce prevention' explanations. Furthermore, I have also found that the reduction in the cost of divorce has improved the decision-making power of women.

The findings in this paper have highlighted the importance of analysing the relationship between divorce laws and IPV in the context of a developing country by showing different intra-household dynamics than those observed in developed countries. They have also highlighted the sensitivity of the results to the definition of physical IPV, which suggests the need for using reliable and validated definitions, as those employed in this paper.

My results have a clear policy implication. They suggest that laws aimed at making the dissolution of marriage easier can contribute to reduce IPV, even when spouses do not divorce. However, they can also have adverse consequences on women if these types of reforms lead to, for instance, a 'male backlash effect'. This suggests the need for complementing easier access to divorce with interventions that challenge 'traditional' views on gender roles. Taken together, my findings are of particular importance in the current

context of Mexico, where states are gradually introducing unilateral divorce, as well as for other developing countries considering such measures.

Chapter 4

The Mexican Drug War: Elections and homicides

4.1 Introduction

Homicides have increased significantly in Mexico since 2008 with approximately 50,000 deaths related to Drug Trafficking Organisations (DTOs) between 2007 and 2011. The negative consequences have been myriad including rising insecurity, deterred economic growth (Enamorado et al., 2014), reduced labour force participation (BenYishay and Pearlman, 2013; Robles et al., 2013; Velásquez, 2015), decreased birth weight (Brown, forthcoming), as well as lower educational performance (Jarillo et al., 2016) and school completion rates (Brown and Velasquez, 2017). One of the main explanations put forward in the previous literature is the crackdown on drugs initiated by the former President Felipe Calderón—from the conservative party, PAN[1]— in December 2006. A key aspect of this enforcement strategy has been the deployment of thousands of military and federal police forces (about 45,000 by 2011) to debilitate DTOs including through the arrest and killing of their leaders. As a consequence, major DTOs have fragmented, and conflict has spurred among them for leadership and control of strategic territories (Calderon et al., 2015; Dell, 2015; Escalante Gonzalbo, 2011; Guerrero-Gutiérrez, 2011).

In this paper, I hypothesise that turf wars among DTOs—one of the consequences of the crackdown on drugs—are related to the electoral cycle. In particular, I posit that, if DTOs' fight with each other to gain control over valuable municipalities, as evidence suggests, a period in which there is a greater incentive to do so is the lame duck period (i.e. between the election and the inauguration of the new term). An election always represents the entrance of a new government in Mexico[2]. Moreover, there is plenty of evidence showing that DTOs capture politicians, public officials, and police officers (Morris, 2012). Thus, political turnover is likely to imply a breakdown of the *status quo*, which leaves DTOs already operating in the municipality (i.e. incumbent DTOs) in a weaker position in the lame duck period as compared to other periods of the electoral cycle. If this is exploited by

[1] *Partido de Acción Nacional* (National Action Party).

[2] Until 2014 re-election was not possible for any political position at the municipality level, including for mayor and council member. A political reform introduced in 2014 allows for re-election for an additional term, but this is outside my sample period.

rival DTOs, then turf wars should increase during this time. Finally, one would expect to find differences depending on the party affiliation of the elected government. Given that PAN mayors—i.e. mayors of the same party as the federal government—are likely to have implemented the enforcement strategy more intensively (Dell, 2015), one would expect to see territorial disputes concentrated on municipalities in which non-PAN mayors win the election[3].

A proxy for turf wars among DTOs is homicides. I exploit an official government database on killings perpetrated by DTOs on other DTOs at the municipality and monthly levels for the period between December 2006 and December 2010. For analysing the question of interest, I estimate the effect of being in the lame duck period on the probability of having at least one homicide and the homicide rate[4]. I define the lame duck period based on the date of the election and inauguration, which I obtain from each of the 32 electoral institutes of Mexico.

The identification strategy relies on the exogeneity of elections. This is a plausible assumption in Mexico given that the dates of elections are set in the Constitution and electoral laws of each state. I estimate OLS fixed effects models in which I control for municipality, year and month fixed effects. In additional specifications and, specifically, when considering the results of elections, I use a regression discontinuity (RD) design in which I exploit close elections.

The baseline findings show that the probability of having at least one homicide as a consequence of killings among DTOs significantly increases by 1.2% (or 11.6% of the sample mean) in the lame duck period, as compared to other periods of the electoral cycle, in municipalities valuable for DTOs. I proxy for this latter using an indicator of whether the municipality is below the median distance to the closest point of entry in the US. The homicide rate also increases, although the effect is insignificant. These results

[3]This would occur if DTOs try to avoid crackdowns, which is a rational strategy to follow given the negative consequences that they have on their criminal activities (Dell, 2015).

[4]As explained later, I use two transformations of the homicide rate in order to deal with its high skewness, i.e. the homicide rate in natural logarithms and the inverse hyperbolic sine transformation of the homicide rate.

hide, however, heterogeneous effects by the winning party of the election. Municipalities in which the PAN wins experience a decrease in homicides, regardless of the definition used, while those in which it loses experience an increase. In particular, the increase in homicides is driven by municipalities in which the PRI[5]—the largest political party of Mexico and main opponent of the PAN—wins the election[6]. The effect is large and significant across the three definitions of homicides (3-7% or 31-35% of the sample mean).

Taken together, my findings are consistent with the hypothesis outlined above. First, turf wars are likely to occur in municipalities more valuable for DTOs' criminal activities. Second, DTOs try to gain control over valuable municipalities during the lame duck period when incumbent DTOs might be relatively weaker than in other periods of the electoral cycle. Third, DTOs do not dispute territories which are expected to have a crackdown on drugs, i.e. those in which a PAN mayor has been elected. Instead, they concentrate the territorial disputes in municipalities in which a PRI mayor has been elected.

I also rule out alternative explanations for my findings. First, I show that there is no general increase in homicides during the lame duck period for reasons other than the electoral cycle. I test for this looking at the impact of being in the lame duck period on other types of DTO-related homicides (e.g. killings of police and military agents by DTOs), murders of politicians and murders of journalists. Second, I present evidence that the increase in homicides is not driven by political party turnover, but rather by the change in government. Finally, I also provide evidence that the results are unlikely to be the consequence of a stronger enforcement strategy during the lame duck period.

This paper contributes to two strands of previous literature. First, a body of research that aims to understand the reasons behind the boost in violence since 2008. A number of recent papers (Calderon et al., 2015; Dell, 2015) have found support for the hypothesis that the crackdown on drugs initiated in December 2006 has, at least, partly explained the recent increase in homicides. My paper focuses on one of the main mechanisms linking

[5] *Partido Revolucionario Institucional* (Institutional Revolutionary Party).

[6] A third major party is the PRD (*Partido de la Revolución Democrática*) [Party of the Democratic Revolution]. No significant association between the lame duck period and homicides is observed when the PRD wins the election.

this enforcement strategy with homicides, i.e. turf wars among DTOs. It adds to the literature by analysing the role of the electoral cycle—in particular, of the lame duck period— in explaining the temporal variation in turf wars.

A second strand of the literature to which this paper contributes is that focused on the relationship between electoral cycles, violence and DTOs (Alesina et al., 2016b; Daniele and Dippopa, 2017). To the best of my knowledge, this question has only been analysed in the context of Italy. My paper adds to this previous literature in two ways. First, by examining whether electoral cycles affect homicides in the context of a Latin America country and, in particular, Mexico. Mexico represents a unique case study in the sense that it has recently experienced unprecedented levels of violence[7]. Second, by analysing homicides perpetrated by DTOs on other DTOs. Previous studies have looked at overall homicides or murders of politicians[8]. However, if homicides are related with DTOs, one would expect these organisations not only to be the perpetrators of violence but also the victims of it.

The rest of the paper is organised as follows. Section 4.2 discusses the possible reasons for an increase in violence around elections. Section 4.3 highlights some particular features of the Mexican context. Section 4.4 describes the data and sample. Section 4.5 presents the identification strategy. Section 4.6 reports the results, including the baseline estimates, heterogeneous effects by winning party, and robustness checks. It also rules out alternative explanations for my findings. Finally, section 4.7 concludes.

4.2 Literature review

As mentioned above, this paper is related to two strands of the literature. The first one refers to a body of research aiming to explain the reasons behind the increase in homicides since 2008. One of the main reasons posited has been the crackdown on drugs

[7]According to data from the United Nations Office on Drugs and Crime, the overall homicide rate in Mexico between 2007 and 2010 was 14.7%, while in Italy 1.0%. Moreover, the number for Mexico, 14.7%, is larger than the homicide rate experienced in Italy during its most violent periods, e.g. in the turn of the 20th century, and between the mid-1970s and mid-1990s.

[8]Also homicides of entrepreneurs, police and union members (Alesina et al., 2016b).

initiated by the federal government in December 2006. Initial studies arguing in favour of this explanation were mainly descriptive (Escalante Gonzalbo, 2011; Guerrero Gutiérrez, 2011; Merino, 2011). Two recent papers (Calderon et al., 2015; Dell, 2015) depart from this approach in an attempt to address endogeneity concerns and provide a causal interpretation.

Dell (2015) exploits close elections to isolate exogenous variation in this enforcement strategy. The motivation is that municipalities in which the PAN wins are likely to implement the crackdown on drugs more intensively than those in which it loses. Using an RD design, she finds that the homicide rate (of both DTO-related and overall homicides) increases in the post-inauguration period in municipalities in which the PAN barely wins the election as compared to those in which it barely loses. She also finds that the increase in homicides is driven by municipalities more valuable for DTOs[9]. Together, she interprets her findings as evidence that crackdowns weaken incumbent DTOs, which increases the incentives of rival DTOs to fight over these municipalities. The findings of my paper are also in line with the hypothesis that territorial disputes are more likely to occur when incumbent DTOs are weaker. However, unlike Dell (2015), the source of this weakness arises from the fact that there are elections, rather than the results of them. Thus, both papers should be interpreted as complementary.

A second paper analysing the role of the federal enforcement strategy on homicides is that by Calderon et al. (2015). They compare municipalities in which DTOs are present with a synthetic control group of municipalities in which they are not before and after a kingpin or a lieutenant is arrested or killed. They find that murdering a DTO leader increases the number of DTO-related and overall homicides in the six months after the neutralisation. They also examine heterogeneous effects by how valuable the municipality is for DTOs[10]. Similar to Dell (2015), they find that the increase in DTO-related homicides

[9]They measure this with two variables. One is an indicator of whether the municipality is above the median distance to the Mexican-US border. The other one is an indicator of whether the homicide rate of the municipality was below the average value before Felipe Calderón took office.

[10]Using an indicator of whether the municipality has at least an airport, aerial landing field, freight train crossing, seaport or Mexican-US border crossing.

is concentrated on valuable municipalities, and for these territories violence also expands up to 12 months after the capture or killing of a kingpin. Overall homicides are also larger in these municipalities, but the effect is insignificant.

Several other studies have gone beyond the crackdown on drugs to explain the boost in homicides. Castillo et al. (2014) find that seizures of cocaine in Colombia have led to an increase in the overall and DTO-related homicide rates in Mexico. They motivate this finding with a model in which cocaine supply shortages (as a consequence of seizures) lead to an increase in the potential revenue from cocaine, provided that its demand is inelastic, which in turn raises violence. Dube et al. (2016) show that maize price changes have contributed to the expansion of the drug sector. In particular, negative shocks to the maize price lead to a differential increase in the cultivation of illegal drug crops (marijuana and opium poppy), the presence of DTOs and DTO-related homicides in municipalities more suitable to produce maize. Negative shocks to the maize price represent an incentive for producers to increase their cultivation of illegal crops, as well as for DTOs to expand into maize-dependent territories, which increases turf wars. Some studies also find that homicides increased following the expiration of the U.S. Assault Weapons Ban, although they focus mainly on the period before Felipe Calderón's Presidency (Chicoine, 2017; Dube et al., 2013).

My paper is also related to a second body of research, which aims to analyse the relationship between electoral cycles, DTOs and violence. My paper is most closely associated with two studies in the context of Italy (Alesina et al., 2016b; Daniele and Dippopa, 2017). Alesina et al. (2016b) develop a model in which a criminal organisation uses violence as a signal of its military strength in order to help the captured party to become elected[11]. One of their predictions is that violence increases in the pre-electoral period[12]. Focusing

[11]Violence can take several forms. First, it can be used to directly eliminate candidates who are not captured. New candidates could be of lower quality or more intimidated, which can influence the electoral results. Second, violence can be used to intimidate voters in order to increase the vote share of the captured politicians. Third, violence can also be used against other key actors, such as campaign workers, which could serve as an intimidating signal for the candidates.

[12]There are other theoretical works that incorporate the role of criminal organisations in influencing the electoral outcome. Some of these models predict that criminal organisations help their preferred politicians to win the elections through the sale of votes. They also predict that the effect is larger when

on national elections over a long period of time, they find support for this prediction. In particular, they show that homicides of politicians by the Sicilian Mafia increase significantly in the 12 months before an election (period 1945-2013). They also analyse overall homicide rates between 1987 and 2012, and find that they increase significantly more in regions with a historical presence of criminal organisations, as compared to other regions, in the 12 months before an election.

Daniele and Dippopa (2017) analyse the effect of elections on pre- and post-electoral violence by defining the electoral cycle as a set of monthly dummies over a period of 12 months before and 12 months after[13]. Unlike Alesina et al. (2016b), they focus on municipal elections during 2010-2014, and look at attacks towards politicians. Their results show that attacks increase in the month after the election—when important decisions by the elected government are made—in regions with historical presence of the Mafia. These results stand in sharp contrast to those found by Alesina et al. (2016b)[14]. In addition, Daniele and Dippopa (2017) find that the increase in violence is driven by municipalities in which the government changes[15].

4.3 The relationship between politics and DTOs in Mexico

The relationship between politics and DTOs in Mexico cannot be understood without making reference to the PRI. The PRI was founded in 1929 and for nearly 60 years dominated all levels of government (i.e. federal, state and municipal). This was accomplished

these politicians face strong competition (Acemoglu et al., 2013; De Feo and De Luca, 2017). Although violence can be one of the tactics used to coerce voters, these models do not focus on explaining the emergence of it.

[13]Previous theoretical papers have incorporated the role of interest groups in influencing politicians once they are in office (Bó and Tella, 2003; Dal Bó et al., 2006). DTOs can be considered to be one type of interest groups. Bó and Tella (2003) develop a model in which there is a honest government (comprised of a president and a political party) and an interest group. The latter uses threats of punishment (e.g. physical violence, legal harassment and smear campaigns) to influence the actions of the president and divert them towards its own interests. Dal Bó et al. (2006) extend this model by considering that interest groups use not only threats of punishment but also bribes.

[14]They provide several possible reasons in the 'Conclusions' section of their paper.

[15]In Italy, mayors have a two-term limit.

through a variety of strategies which ranged from vote buying to electoral fraud passing through patronage and control of mass media (Schedler, 2002). The PRI lost its first municipality (Ciudad Juárez, Chihuahua) in 1983 against the PAN, which denoted the start of the hegemony breakdown. In 1989, it lost its first state government (Baja California), which was followed by eventually the Presidency in 2000 against the PAN.

The control of the political arena by the PRI facilitated the emergence of a clearly defined structure of corruption in which DTOs operated with relatively permissiveness in exchange for bribes, no violence, discretion and no drugs staying in Mexico. During this time, a few DTOs with strong leaders existed, and the levels of violence were relatively stable. This system started to erode in the 1990s as political competition increased and Mexico became a key actor in the international drug trade business. In the new scenario, the rules governing the relationship between politicians and DTOs are no longer centralised by a single party. Instead, DTOs have to individually capture politicians, police officers, public officials, or any other authority[16].

The new scenario also came with an increasing use of enforcement as a way to fight DTOs. One of the main tools employed consisted in the deployment of police and military forces to dismantle DTOs through, for instance, the arrest of their leaders. This strategy became more evident with the victory of Vicente Fox (2000-2006)—from the PAN—, which represented the turnover in the federal political party after 70 years of PRI control. It further intensified by his successor, Felipe Calderón (2006-2012), who deployed thousands of agents to confront DTOs. The magnitude of the military deployment and the number of arrests in this latter administration represents a significant change with respect to the previous governments[17]. In 2012, the PRI returned to power, but the crackdown on drugs has not changed since then[18].

This enforcement strategy has helped to fragment the major DTOs that existed in

[16]See Celaya Pacheco (2009); Hernández (2010); Morris (2012); Osorio (2016), and Snyder and Duran-Martinez (2009) for more details on the evolution of Mexican politics, the history of DTOs, and their interconnection.

[17]See Chabat (2010) and Guerrero-Gutiérrez (2011) for more details on the enforcement strategies.

[18]This period is, however, outside my sample, and thus it will not affect the interpretation of my findings.

the 1980s, and spurred conflict within them for leadership, as well as among them for the control of strategic territories. For instance, the number of major DTOs has increased from 6 in 2006 to 16 in 2011 (Guerrero-Gutiérrez, 2011). Disputes between DTOs are likely to intensify in the lame duck period given the change in the *statu quo*. If political turnover represents a breakdown of the 'agreements' between the incumbent DTOs and the government—because there is a change in government—, the former will become relatively weaker during this period. This increases the likelihood that rival DTOs will attempt to usurp territories.

4.4 Data and sample

Homicides

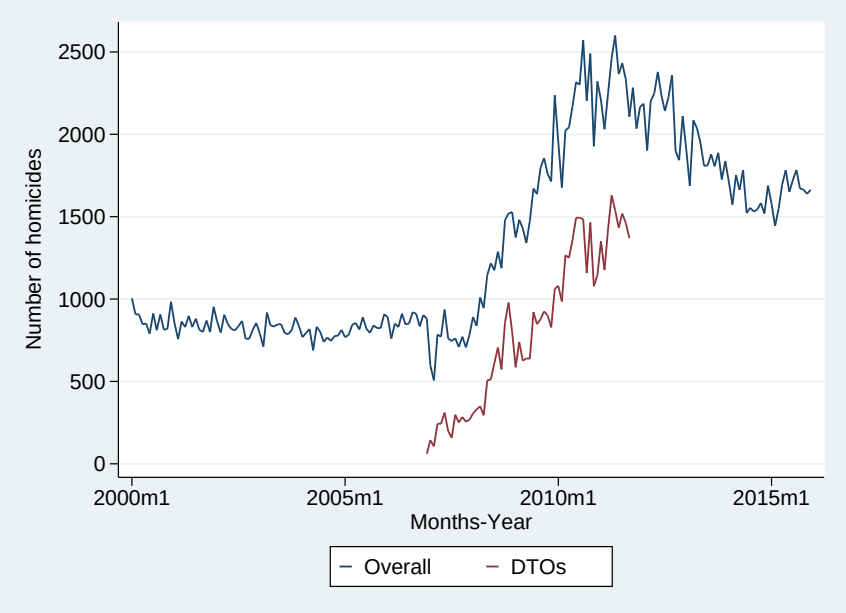
My main analysis uses official government data on homicides related with DTOs. These were published during the administration of Felipe Calderón. The database distinguishes three types of homicides. First, 'executions', which refer to the targeted killings of DTO members perpetrated by other DTOs. Second, 'aggressions', which are the direct attacks of DTOs on authorities (this mainly includes military and police forces). Third, 'confrontations', which are the deaths of DTOs or authorities as a consequence of confrontation between them. These data cover the period between December 2006 and September 2011, although the disaggregated sub-categories are only available until December 2010. The total number of DTO-related homicides until December 2010 was 34,612. 89.3% of them are classified as executions, 1.6% as aggressions, and 9.1% as confrontations. I am mainly interested in executions since this is the type of homicide that captures turf wars between DTOs[19]. Even so, I will also use aggressions and confrontations in some specifications.

In order to provide some descriptive comparison between overall intentional homicides and DTO-related ones, figure 4.1 shows the monthly number of both types of homicides

[19]I use the words executions and homicides interchangeably from now on.

between 2000 and 2015. Data for the latter refers to December 2006-September 2011. As can be seen, both types of homicides have followed a very similar trend. Moreover, DTO-related ones represent, on average, 48% of all homicides during this period with this number increasing over time.

Figure 4.1: Overall intentional homicides and DTO-related homicides



Notes: Overall intentional homicides refer to the period 2000-2015, whereas DTO-related ones to December 2006-September 2011. The X axis refers to the month-year. Overall intentional homicides are based on death certificates obtained from INEGI *(Instituto Nacional de Estadística y Geografía)* [National Institute of Statistics and Geography]. They include deaths coded under the causes X85-Y09 of the ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision).

In addition to DTO-related homicides, I use two additional types of homicides. The first one refers to murders of politicians. These include homicides of mayors, ex-mayors, candidates for mayor, elected candidates for mayor (not in office yet), substitute mayors, councillors, ex-councillors, candidates for councillor, and public trustees. I have constructed this database using information from two primary sources, namely the *Asociación de Autoridades Locales de México* (Association of Local authorities of Mexico) and the newspaper *El Universal*[20]. I have validated all homicides employing the main newspapers of the country[21]. The second source of information that I employ refers to

[20] `http://interactivo.eluniversal.com.mx/2016/alcaldes-asesinados/`.

[21] For instance, *El Universal, Reforma, Milenio, Excélsior* and *La Jornada*.

murders of journalists. These data come from the *Federacion de Asociaciones de Periodistas Mexicanos* (Federation of Associations of Mexican Journalists)[22].

For each type of homicide, I construct two dependent variables. The first one is a dichotomous variable equal to one if there has been at least one homicide in the municipality in that year and month, and zero otherwise. Focusing on executions, 7% of observations have a value of one, and, within these, the average number of homicides is 2.6. Moreover, 75% and 93% of the observations have at most two and five homicides, respectively. Taken together, this suggests that using an indicator is an appropriate dependent variable.

The second one is the homicide rate, which is the number of homicides per 100,000 inhabitants in each municipality, year and month. The average value in my sample is 0.37. Population data are obtained from the Population Count of 2005 and the Population Census of 2010. For years 2006-2009 data from the 2005 Count is used. Given that the homicide rate is highly skewed to the right, my first approach is to use this variable in natural logarithms[23]. The problem with using logarithms is that there are a large number of observations with zero homicides. To address this, I add a parameter equal to one to the homicide rate, and then take the natural logarithm of this sum[24]. My second approach to deal with the high skewness of the homicide rate is to employ the inverse hyperbolic sine[25], which, unlike the log transformation, is defined at zero. The interpretation is similar to that when the homicide rate is transformed with the natural logarithm (Burbidge et al., 1988; Pence, 2006).

Elections

The main sample uses electoral data on municipal elections occurring between 2007 and 2010[26]. I obtain these data from each of the 32 electoral institutes of Mexico (one for

[22]It has been complemented using information available in `http://www.nuestraaparenterendicion.com/tuyyocoincidimosenlanocheterrible/index.php/por-fecha-`

[23]This has been a common approach in the previous criminal literature (Castillo et al., 2014; Enamorado et al., 2016).

[24]Adding one has been a common solution in previous studies (see, for instance, Alesina et al. (2016b)).

[25]For a given variable y, the inverse hyperbolic sine is defined as $ln(y + \sqrt{1 + y^2})$.

[26]In 2010, Mexico had 2,456 municipalities. Since then 6 more have been created..

each state)[27]. In particular, I employ the date of the election, the date of inauguration, the number of votes obtained by candidate, and the electoral turnout.

I define the electoral cycle as consisting of 13-18 months. These months include the following sub-periods: the 6 months before the election, the month of the election, the lame duck period which ranges between 0 and 5 months[28], the month of the inauguration, and 5 months of post-inauguration. The lame duck period is the period between the month after the election and the month before the inauguration. Depending on its length, the number of observations per electoral cycle varies. As a robustness check, I will consider alternative definitions of electoral cycle. By defining the electoral cycle as 13-18 months I am able to include one electoral cycle for each municipality. In particular, 13 states have elections in 2007, 5 in 2008, 13 in 2009, and 1 in 2010. The last column of table C1 in the Appendix shows the specific year for each of the 32 states. The first and second columns will be used in additional specifications. In this table, one can also see that, with few exceptions, elections are usually held every three years.

For conducting my analysis, I drop municipalities that do not have elections following the system of political parties, but rather *Usos y Costumbres* ('Laws and Customs')[29]. The reason is twofold. First, the date of the election is chosen, with some restrictions, by the indigenous communities and, consequently, it can be endogenous. Second, there are no political parties, which I will need for further analyses. Furthermore, I drop municipalities that have extraordinary elections because the date of the election could be endogenous. After these adjustments, my sample consists of 2004 municipalities.

[27]During my time span, Mexico had 31 states and one Federal District, but I will refer to all of them as states for simplicity.

[28]It is zero in only two states, namely Estado de Mexico and Yucatan.

[29]This applies to some indigenous communities, especially in the southern state of Oaxaca. These communities have specific rules for the election of the town council.

4.5 Identification strategy

The baseline equation is given by the following expression:

$$Homicide_{myt} = \beta_0 + \delta Electoral_{myt} + \alpha_m + \gamma_y + \mu_t + \varepsilon_{myt} \tag{4.1}$$

where m stands for municipality, t for month and y for year. $Homicide_{myt}$ can take three different definitions: an indicator of whether there has been at least one homicide, the natural logarithm of the homicide rate, or the inverse hyperbolic sine transformation of the homicide rate. $Electoral_{myt}$ is a measure of the electoral cycle. I am mainly interested in an indicator of whether the month is part of the lame duck period. I will also consider alternative periods throughout the analysis. α_m, γ_y and μ_t are full sets of municipality, year and month fixed effects, respectively. α_m controls for unobserved time-invariant factors that vary across municipalities. γ_y captures specific aggregate shocks that affect all municipalities, such as federal reforms (e.g. Criminal Procedure Reform of 2008). μ_t accounts for changes in homicides due to, for instance, seasonality. ε_{myt} is the idiosyncratic error term. I cluster the standard errors at the municipality level to allow for autocorrelation within municipalities over time (Bertrand et al., 2004).

The identification of the effect of elections on homicides relies on the exogeneity of the timing of elections. For instance, if the timing of elections is correlated with unobserved time-varying municipality factors that also affect the outcome, the estimates would be inconsistent. Exogeneity is a plausible assumption given that the dates of the elections are set in the constitutions and electoral laws of each state. Moreover, since the late 1990s all states have independent and autonomous electoral institutes in place[30].

In order to test for the hypothesis outlined in section 4.1, I augment equation 4.1 by interacting $Electoral_{myt}$ with an indicator of whether the municipality is valuable for

[30]Until the mid-1990s elections were often accused of being rigged, as discussed in section 4.3. In an attempt to make the party system more competitive and transparent, and increase citizen's trust in the electoral system, several reforms were introduced since the mid 1960s, and especially in the 1990s, being the creation of the electoral institutes one of their results (Gillingham, 2012).

DTOs. One proxy for whether a municipality is valuable is its proximity to the US[31]. In particular, I define 'proximity to the US' as an indicator of whether the municipality is below the median distance to the closest entry point in the US[32]:

$$\begin{aligned} Homicide_{myt} =& \beta_0 + \delta_1 Electoral_{myt} + \delta_2 Electoral_{myt} \times Distance_m \\ &+ \alpha_m + \gamma_y + \mu_t + \varepsilon_{myt} \end{aligned} \tag{4.2}$$

The indicator '$Distance_m$' is absorbed by the municipality fixed effects, α_m. Just to provide some descriptive statistics, 10% of the observations below the median distance have at least one homicide, while this figure decreases to 4% for those above. The homicide rate is 0.67 versus 0.12, respectively. These differences are statistically significant.

4.6 Results

Effect of lame duck period on executions

Table 4.1 presents the results from estimating equations 4.1 (panel A) and 4.2 (panel B). I define 'Electoral' as an indicator of whether the month is part of the lame duck period. Given that my data set is at the monthly level, the lame duck period could also be partly captured in the month of election and the month of inauguration. Thus, I also include indicators for these two periods to examine whether this seems to be the case. The dependent variable in columns 1-2 is an indicator of whether at least one homicide has occurred, in columns 3-4 the natural logarithm of the homicide rate, and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. Specifications 1, 3

[31] This proxy has been used in a number of previous studies including Castillo et al. (2014) and Dell (2015).

[32] I calculate the distance between the centroid of the municipality and the closest point of entry in the US, and then compute the median value of all the municipalities. Using this information, I construct a dichotomous variable equal to one if the distance is smaller than the median value, and zero otherwise. The centroid is obtained using GIS, while the coordinates of the entry points using Google Earth. By point of entry to the US I am referring to Mexico-US border crossing points and main seaports in Mexico usually employed by DTOs for trafficking drugs.

and 5 control for municipality and year fixed effects, while specifications 2, 4 and 6 also add month fixed effects.

Focusing on panel A, the coefficient of the 'lame duck' variable is generally statistically insignificant. Panel B shows that this is hiding, however, heterogeneous impacts by the distance to the US. Municipalities above the median distance experience a decrease in the probability of having a homicide and in the homicide rate during the lame duck period. This decrease is significant when month fixed effects are controlled for. In contrast, municipalities below the median distance—the ones I am interested in—experience an increase, although the overall effect is only significant in columns 1-2 (see row 'Lame duck (Distance=1)'). After controlling for month fixed effects, the probability of having at least one homicide in the lame duck period, as compared to other periods, is 1.2% (significant at the 10% level), which is significantly different than the effect for municipalities far from the US. Compared to the average value in the sample (0.104), it represents 11.6%. The homicide rate has also risen (0.9% or 6.1% of the sample mean) in municipalities close to the US during the lame duck period (column 4), although the coefficient is insignificant. Estimating the impact on the inverse hyperbolic sine transformation (column 6) yields similar results.

Regarding the months of the election and inauguration, the effect on executions is insignificant for municipalities close to the US, regardless of the type of homicide and whether I control for month fixed effects[33]. It seems that these periods are not capturing part of the effect observed for the lame duck period. Thus, in subsequent sections I only include the 'lame duck' indicator since this variable more accurately accounts for the period of interest.

[33]My results are very similar if I estimate separate equations for each definition of 'Electoral'.

Table 4.1: Effect of lame duck period on executions – Baseline specification

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: Homogeneous effects						
Election	0.005	0.004	0.006	0.004	0.008	0.005
	(0.005)	(0.005)	(0.008)	(0.008)	(0.010)	(0.011)
Lame duck	0.006*	-0.000	0.006	-0.003	0.007	-0.003
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)
Inauguration	-0.005	-0.008	-0.009	-0.009	-0.012	-0.012
	(0.005)	(0.006)	(0.009)	(0.010)	(0.011)	(0.012)
Panel B: Heterogeneous effects by distance to the US						
Election	0.001	0.002	0.010	0.009	0.013	0.012
	(0.006)	(0.006)	(0.008)	(0.008)	(0.010)	(0.011)
Election × Distance	0.009	0.007	-0.009	-0.012	-0.009	-0.014
	(0.010)	(0.010)	(0.016)	(0.017)	(0.020)	(0.021)
Lame duck	-0.005	-0.011**	-0.005	-0.012*	-0.007	-0.015**
	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.008)
Lame duck × Distance	0.025***	0.023***	0.023*	0.020	0.030*	0.026
	(0.008)	(0.008)	(0.013)	(0.013)	(0.016)	(0.016)
Inauguration	-0.007	-0.009	-0.015**	-0.016*	-0.018**	-0.020*
	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
Inauguration × Distance	0.004	0.003	0.012	0.014	0.015	0.018
	(0.010)	(0.010)	(0.018)	(0.019)	(0.023)	(0.023)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,852	29,852	29,852	29,852	29,852	29,852
Municipalities	2,004	2,004	2,004	2,004	2,004	2,004
Lame duck (Distance=1)	0.020***	0.012*	0.018	0.009	0.023	0.011
	(0.007)	(0.007)	(0.012)	(0.013)	(0.015)	(0.016)

Notes: This table estimates equations 4.1 (panel A) and 4.2 (panel B). The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Election', 'Lame duck' and 'Inauguration' are indicators of whether the month is the month of the election, is part of the lame duck period, and is the month of the inauguration, respectively. 'Lame duck' is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

In sum, the results so far suggest that the probability of having a homicide significantly increases during the lame duck period, as compared to other periods, for municipalities close to the US. The effect on the homicide rate points in the same direction, but is is statistically insignificant. Taken together, this is in line with the hypothesis outlined

in section 4.1, i.e. turf wars among DTOs should be higher in municipalities valuable for DTOs during the lame duck period when fighting over territories might be relatively easier (due to the weakening of the incumbent DTOs) as compared to other periods of the electoral cycle. The finding that turf wars are more likely to occur in territories strategic for DTOs when the incumbent DTOs become weaker is in line with the findings in Dell (2015). As mentioned earlier, one of the main differences of my paper with respect to hers is that she focuses on the effect of crackdowns—through PAN victories—, while I look at the impact of holding elections.

So far I have ignored the count nature of the data. I next estimate equation 4.1 using Poisson and negative binomial fixed effects models, and the homicide rate as the dependent variable. These models have, however, several limitations and estimates should be interpreted carefully[34]. Table C2 in the Appendix reports the results. The coefficient associated with the variable 'lame duck' is insignificant across all specifications, which is consistent with the OLS results.

In the rest of the paper, I present OLS estimates, which responds to two main motivations. First, Poisson and negative binomial models present serious limitations, which do not necessarily make them a better choice than their OLS counterpart (see discussion in footnote 34). Second, OLS results are easier to interpret, especially when analysing heterogenous effects like in equation 4.2. It is well known that in non-linear models, like the two discussed here, the interaction effect is not equal to the coefficient of the interaction,

[34] A key assumption of the Poisson model is that the mean of the dependent variable equals its variance (i.e. there is no over-dispersion), which might not hold. To provide some insights into this, I perform a goodness-of-fit test of the model after running an unconditional fixed effects Poisson model, which reports the deviance statistic and the Pearson statistic. In both cases, they are significant at least at the 1% level, which means that I can reject the null hypothesis that the data is Poisson distributed. One of the main consequences of the presence of over-dispersion is that the reported standard errors will be incorrect, and they can be highly underestimated (Allison and Waterman, 2002). Consequently, I also present estimates obtained from using a negative binomial model, which does not require the no over-dispersion assumption to hold. This model is, however, not free of criticism. In particular, Allison and Waterman (2002) argue that the conditional negative binomial fixed effects model (Hausman et al., 1984), which is implemented in Stata using the command *xtnbreg, fe*, is not a 'true fixed-effects method'. Indeed, in the Stata manual it says '"fixed effects" applies "to the distribution of the dispersion parameter, and not to the $X\beta$ term in the model'. Not controlling for municipality fixed effects can seriously bias my estimates, which makes negative binomial models, at least in my case, not an adequate alternative to Poisson ones.

but varies across municipalities[35].

Heterogeneous effects by winning party

The effect of being in the lame duck period on executions could differ by whether the PAN wins the election[36]. Municipalities governed by a PAN mayor are likely to have implemented the crackdown on drugs more intensively than municipalities governed by a non-PAN mayor (Dell, 2015). As a consequence, DTOs might decide not to fight over valuable territories before the PAN takes office as a way to avoid the direct consequences of crackdowns[37]. If this hypothesis is in place, executions in municipalities with a PAN victory should not increase in the lame duck period. In order to analyse this, I interact the 'lame duck' and 'distance' variables with an indicator of whether the PAN has won the election. Panel A of table 4.2 presents the results[38]. As hypothesised, the probability of having a homicide, as well as the homicide rate, do not significantly increase in the lame duck period when the PAN wins the election (and the sign is negative in all cases), while they do when it loses[39].

Given that executions increase when the PAN does not win the election, in panels B and C I examine whether this is driven by the PRI and/or PRD, respectively. Unlike municipalities in which the PAN wins the election, those in which the PRI does experience a significant and large increase in the probability of having a homicide and in the homicide rate during the lame duck period. For instance, the probability of having a homicide increases by 3.4% (column 2), while the homicide rate by 5.3% (column 4) and 6.8% (column 6), which represent 30.6%, 34.8% and 35.1% of the sample mean, respectively.

[35]For Logit and Probit models see papers by Ai and Norton (2003) and Greene (2010). The same ideas apply to other non-linear models, such as Poisson and negative binomial.

[36]The PAN wins in 24% of municipalities, the PRI in 57% and the PRD in 15%. The rest up to 100% corresponds to minor parties.

[37]Instead, they might decide to dispute the territory once the crackdown has occurred, which would be in line with the findings in Dell (2015).

[38]Although not reported, the estimations also control for $Lame\ duck \times PAN$, $Distance \times PAN$, $Distance$ and PAN.

[39]The number of observations is smaller than in table 4.1 because I remove (i) elections in which the winner is a coalition formed by at least two major parties, and (ii) elections in which the party (PRI, PAN or PRD) does not run for election. This latter is the reason for the different number of observations across panels.

The results for the PRD point in the same direction as those obtained for the PAN, although in this case the coefficients are all insignificant. Thus, the electoral cycle does not seem to be associated with executions when the PRD wins. Given this, in subsequent specifications I focus on the PRI and PAN only[40].

[40]Indeed, consistent with the results in table 4.2, estimates in subsequent regressions are all insignificant when there is a PRD victory.

Table 4.2: Effect of lame duck period on executions – Heterogeneous effects by winning party

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: PAN wins						
Lame duck	-0.008**	-0.013***	-0.010*	-0.014**	-0.012**	-0.018**
	(0.004)	(0.005)	(0.005)	(0.006)	(0.007)	(0.008)
Lame duck × Distance	0.031***	0.030***	0.044***	0.041**	0.056***	0.052***
	(0.010)	(0.009)	(0.016)	(0.016)	(0.020)	(0.020)
Lame duck × Distance× PAN	-0.024	-0.025	-0.077**	-0.080***	-0.096**	-0.100**
	(0.018)	(0.018)	(0.030)	(0.030)	(0.038)	(0.038)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	28,413	28,413	28,413	28,413	28,413	28,413
Municipalities	1,907	1,907	1,907	1,907	1,907	1,907
Lame duck × Distance (PAN=0)	0.023***	0.017*	0.034**	0.027*	0.043**	0.034*
	(0.008)	(0.009)	(0.015)	(0.016)	(0.019)	(0.020)
Lame duck × Distance (PAN=1)	-0.001	-0.009	-0.043	-0.053**	-0.053	-0.066**
	(0.016)	(0.016)	(0.026)	(0.027)	(0.033)	(0.033)
Panel B: PRI wins						
Lame duck	0.003	-0.003	0.007	0.000	0.009	0.000
	(0.006)	(0.006)	(0.008)	(0.009)	(0.010)	(0.011)
Lame duck × Distance	0.007	0.005	-0.015	-0.018	-0.018	-0.021
	(0.011)	(0.011)	(0.019)	(0.020)	(0.024)	(0.024)
Lame duck × Distance× PRI	0.032**	0.032**	0.072***	0.071***	0.090***	0.089***
	(0.015)	(0.015)	(0.026)	(0.026)	(0.032)	(0.032)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,427	29,427	29,427	29,427	29,427	29,427
Municipalities	1,975	1,975	1,975	1,975	1,975	1,975
Lame duck × Distance (PRI=0)	0.010	0.002	-0.008	-0.018	-0.009	-0.021
	(0.010)	(0.010)	(0.018)	(0.018)	(0.022)	(0.023)
Lame duck × Distance (PRI=1)	0.041***	0.035***	0.064***	0.053***	0.081***	0.068***
	(0.012)	(0.012)	(0.019)	(0.020)	(0.024)	(0.024)
Panel C: PRD wins						
Lame duck	-0.006	-0.011**	-0.007	-0.013*	-0.009	-0.016**
	(0.004)	(0.005)	(0.005)	(0.007)	(0.007)	(0.008)
Lame duck × Distance	0.030***	0.029***	0.032**	0.028*	0.041**	0.036*
	(0.009)	(0.009)	(0.015)	(0.016)	(0.019)	(0.019)
Lame duck × Distance× PRD	-0.025	-0.024	-0.035	-0.030	-0.044	-0.037
	(0.021)	(0.021)	(0.033)	(0.033)	(0.041)	(0.041)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	27,219	27,219	27,219	27,219	27,219	27,219
Municipalities	1,827	1,827	1,827	1,827	1,827	1,827
Lame duck × Distance (PRD=0)	0.024***	0.017**	0.025*	0.016	0.032*	0.020
	(0.008)	(0.009)	(0.015)	(0.015)	(0.018)	(0.019)
Lame duck × Distance (PRD=1)	-0.001	-0.007	-0.010	-0.014	-0.012	-0.017
	(0.020)	(0.019)	(0.029)	(0.030)	(0.037)	(0.038)

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'PRI' is an indicator of whether the PRI wins the election. 'PAN' and 'PRD' are defined in an analogous way. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

These estimates might suffer, however, from endogeneity. For instance, whether the PAN wins the election might be correlated with unobserved municipality characteristics, such as voting preferences, which could also influence homicides. To deal with endogeneity concerns, I next identify the impact of winning the election on executions using a sharp RD design of close elections. Specifically, I compare homicides in municipalities where the party of interest barely wins—treatment group—with municipalities in which it barely loses—control group—[41][42].

I estimate the following equation using a local polynomial method, which has been shown to have better properties than the global polynomial method (Hahn et al., 2001; Porter, 2003)[43]. This approach restricts the sample to municipalities defined as having a close election, where close is computed according to the optimal bandwidth selection procedure in Calonico et al. (2014)[44]:

$$Homicide_m = \beta_0 + \delta_1 Win_m + f(MV_m) + \delta_2 Win_m \times f(MV_m) + \varepsilon_m \tag{4.3}$$

where m stands for municipality. $Homicide_m$ is the outcome of interest defined in the three ways as explained before. Win_m is an indicator of whether the party wins the election. This equation is estimated separately for the PRI and PAN. MV_m is the margin of victory, i.e. the running variable. This is defined as the share of votes obtained by the party in question minus the share of votes obtained by its strongest opponent. δ_1 captures the causal impact of winning the election on executions. $f(MV_m)$ fits a first or second-order polynomial of the margin of victory, which is allowed to differ on each side of the discontinuity. The Appendix provides information on the validity of the RD design.

[41]For a review of RD design see Cattaneo et al. (2018a,b); Imbens and Lemieux (2008) and Lee and Lemieux (2010).

[42]Relying on RD designs for estimating causal effects has been an increasingly used approach in the literature in recent years. Examples exploiting close elections include Brollo and Nannicini (2012); Brollo and Troiano (2016); Clots-Figueras (2012); Ferreira and Gyourko (2014); Gagliarducci and Paserman (2012); Lee (2001); Lee et al. (2004); Lee and Card (2008); Pettersson-Lidbom (2008) and Vogl (2014).

[43]This approach is one of the most commonly employed in the literature (Cattaneo et al., 2018a).

[44]The regression uses a triangular kernel function, which assigns the maximum weight to observations at the cutoff. The weight declines as observations lie further away from the cutoff being zero for those outside the optimal bandwidth.

A particularity of the Mexican electoral system is that, in a large percentage of elections, parties run in the form of a coalition[45]. The treatment given to these observations is, therefore, important. When a coalition is formed by one of the three major parties (PRI, PAN, PRD) and small parties, I consider the coalition to be represented by the major party[46]. In the very few cases (less than 1%) in which more than one major party is part of the coalition, I drop these observations[47].

Results from estimating equation 4.3 are reported in table C3. Estimates are not significant, but their sign and magnitude varies considerably across panels. PAN victories lead to a decrease in homicides for municipalities close to the US, which points in the same direction as the findings in table 4.2. In contrast, when the PRI wins the election, homicides increase in this type of municipalities. Moreover, this increases is considerably larger than that experienced by municipalities far from the US.

Taken together, the results in this section suggest that the increase in homicides seen in the baseline specification (panel B of table 4.1) is hiding heterogeneous effects by which party wins the election. In particular, PAN victories seem to decrease homicides in the lame duck period, which is in line with the hypothesis that DTOs perceive these victories as associated with a stronger risk of crackdowns. In contrast, PRI victories increase executions significantly in both statistical and economic terms, which suggests that turf wars are concentrated on these municipalities. The difference observed between these two parties could also be the result of differences in corruption rather than in the risk of crackdowns. For instance, if PRI mayors are more corrupt and, consequently, easier to capture by DTOs than PAN mayors, one would expect turf wars to be concentrated on these municipalities, provided that they are valuable for criminal activities. Although I do not have data on corruption at the municipality level, Dell (2015) provides some evidence

[45]In about 8% of the cases for the PAN, 61% for the PRI, and 33% for the PRD.

[46]The reason is that, in most occasions, a coalition between major and small parties is leaded by the former party. I have data to precisely identify the party affiliation of the candidate for mayor in a very small number of elections, but it points into this direction. Moreover, when looking at the number of votes by party rather than coalition, in most cases the major party obtains the largest proportion.

[47]Although not reported in the results, the estimates are not sensitive to controlling for whether the the PAN or PRI are part of a coalition.

against this argument.

Robustness checks

In this section I conduct two robustness checks. First, I test for whether my results are sensitive to changing the length of the electoral cycle. Second, I test for whether they hold if I control for pre-electoral and post-inauguration periods.

Alternative length of the electoral cycle

The definition of electoral cycle used so far is somehow restrictive[48], which responds to the objective of including one electoral cycle for each municipality. I next extend the electoral cycle to include 6 months more of pre-electoral period, i.e. the electoral cycle ranges between 19 and 24 months instead of 13-18 months. This drops all elections occurring in 2007 and the net effect is a reduction in the number of observations. This test can also be interpreted as a sensitivity test of my results to the municipalities included in the sample. Panel A of table 4.3 reports the results. Panels B and C do the same for the heterogeneous effects by winning party. Table 4.4 further expands the electoral cycle to also include 6 additional months of the post-inauguration period, i.e. 25-30 months of electoral cycle. This also drops states that had elections in 2010[49].

The results in both tables on the whole confirm the baseline findings in table 4.1. The only difference is that now the magnitude of the estimates of interest is larger, and this occurs in the three panels. In addition, panel A of table 4.3 shows that, when the pre-electoral period is extended, the effect of being in the lame duck period on execution for valuable municipalities is significant across the three definitions of homicides (in the baseline case it was only for models 1-2).

[48]By restrictive I mean that only 6 months of pre-electoral and post-inauguration data have been considered for defining the electoral cycle.

[49]Only one in my sample, namely Yucatán.

Table 4.3: Effect of lame duck period on executions – Alternative length of the electoral cycle: Extended pre-electoral period

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: No distinction by winning party						
Lame duck	-0.013*	-0.016*	-0.017*	-0.025**	-0.021*	-0.031**
	(0.008)	(0.008)	(0.009)	(0.011)	(0.012)	(0.014)
Lame duck × Distance	0.047***	0.046***	0.059***	0.060***	0.076***	0.076***
	(0.013)	(0.013)	(0.021)	(0.021)	(0.026)	(0.026)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	18,999	18,999	18,999	18,999	18,999	18,999
Municipalities	911	911	911	911	911	911
Lame duck (Distance=1)	0.034***	0.030***	0.042**	0.035*	0.054**	0.045*
	(0.010)	(0.011)	(0.019)	(0.019)	(0.023)	(0.024)
Panel B: Winning party PAN						
Lame duck	-0.024**	-0.028**	-0.030***	-0.037***	-0.038***	-0.047***
	(0.011)	(0.011)	(0.011)	(0.013)	(0.014)	(0.016)
Lame duck × Distance	0.071***	0.071***	0.106***	0.106***	0.134***	0.134***
	(0.018)	(0.018)	(0.028)	(0.028)	(0.034)	(0.034)
Lame duck × Distance× PAN	-0.068***	-0.068***	-0.131***	-0.130***	-0.165***	-0.163***
	(0.026)	(0.026)	(0.042)	(0.042)	(0.053)	(0.053)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	18,420	18,420	18,420	18,420	18,420	18,420
Municipalities	883	883	883	883	883	883
Lame duck × Distance (PAN=1)	-0.021	-0.025	-0.055	-0.062	-0.069	-0.077*
	(0.022)	(0.022)	(0.034)	(0.035)	(0.043)	(0.043)
Panel C: Winning party PRI						
Lame duck	0.007	0.005	0.012	0.003	0.016	0.005
	(0.011)	(0.012)	(0.015)	(0.016)	(0.019)	(0.021)
Lame duck × Distance	0.017	0.016	0.005	0.006	0.007	0.008
	(0.017)	(0.018)	(0.030)	(0.030)	(0.038)	(0.038)
Lame duck × Distance× PRI	0.068***	0.069***	0.122***	0.121***	0.154***	0.152***
	(0.026)	(0.026)	(0.042)	(0.042)	(0.052)	(0.052)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	18,563	18,563	18,563	18,563	18,563	18,563
Municipalities	890	890	890	890	890	890
Lame duck × Distance (PRI=1)	0.092***	0.089***	0.139***	0.130***	0.177***	0.166***
	(0.022)	(0.023)	(0.032)	(0.033)	(0.041)	(0.041)

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'PRI' is an indicator of whether the PRI wins the election. 'PAN' is defined in an analogous way. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Table 4.4: Effect of lame duck period on executions – Alternative length of the electoral cycle: Extended pre-electoral and post-inauguration periods

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: No distinction by winning party						
Lame duck	-0.004	-0.010	-0.002	-0.013	-0.002	-0.016
	(0.009)	(0.010)	(0.012)	(0.013)	(0.015)	(0.017)
Lame duck × Distance	0.030**	0.029**	0.027	0.028	0.035	0.036
	(0.014)	(0.014)	(0.022)	(0.022)	(0.027)	(0.027)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	21,709	21,709	21,709	21,709	21,709	21,709
Municipalities	805	805	805	805	805	805
Lame duck (Distance=1)	0.026**	0.019*	0.025	0.015	0.033	0.019
	(0.010)	(0.011)	(0.019)	(0.020)	(0.024)	(0.025)
Panel B: Winning party PAN						
Lame duck	-0.022*	-0.028**	-0.021	-0.031**	-0.027	-0.039**
	(0.013)	(0.014)	(0.014)	(0.016)	(0.018)	(0.020)
Lame duck × Distance	0.057***	0.056***	0.072**	0.072**	0.092**	0.092**
	(0.019)	(0.019)	(0.029)	(0.029)	(0.036)	(0.036)
Lame duck × Distance× PAN	-0.072***	-0.072***	-0.128***	-0.127***	-0.161***	-0.160***
	(0.027)	(0.027)	(0.044)	(0.044)	(0.055)	(0.055)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	21,066	21,066	21,066	21,066	21,066	21,066
Municipalities	781	781	781	781	781	781
Lame duck × Distance (PAN=1)	-0.037	-0.044*	-0.077**	-0.085**	-0.095**	-0.107**
	(0.023)	(0.024)	(0.036)	(0.037)	(0.045)	(0.046)
Panel C: Winning party PRI						
Lame duck	0.025*	0.018	0.035**	0.023	0.045**	0.030
	(0.013)	(0.013)	(0.017)	(0.019)	(0.022)	(0.024)
Lame duck × Distance	-0.001	-0.002	-0.024	-0.023	-0.029	-0.028
	(0.018)	(0.018)	(0.031)	(0.031)	(0.039)	(0.039)
Lame duck × Distance× PRI	0.076***	0.075***	0.120***	0.117***	0.151***	0.148***
	(0.027)	(0.027)	(0.044)	(0.044)	(0.054)	(0.055)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	21,251	21,251	21,251	21,251	21,251	21,251
Municipalities	788	788	788	788	788	788
Lame duck × Distance (PRI=1)	0.099***	0.092***	0.131***	0.117***	0.167***	0.150***
	(0.024)	(0.025)	(0.035)	(0.036)	(0.044)	(0.046)

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'PRI' is an indicator of whether the PRI wins the election. 'PAN' is defined in an analogous way. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Controlling for pre-electoral and post-inauguration periods

In order to examine whether my estimates are sensitive to the baseline period considered, I include indicators for the pre-electoral and post-inauguration periods along with the indicator for the lame duck period. This can also shed some light on whether executions have increased outside the lame duck period. Table 4.5 presents the results for the heterogeneous effects by distance to the US. Columns 1, 3 and 5 include an indicator of whether the month is part of the 6 months before the election. Columns 2, 4 and 6 do the same for the six months of the post-inauguration period[50]. As can be seen, the coefficient associated with the 'lame duck' for municipalities close to the US is positive, but fails to reach significance even when the dependent variable in an indicator of whether there has been at least one homicide (models 1-2). In table 4.1, this coefficient was larger in magnitude (0.012) and significant at the 10% level. Thus, it seems that the effect of being in the lame duck period on executions is sensitive to the baseline period considered. This is no longer the case when heterogeneity by the winning party is accounted for (see table 4.6)[51]. Regarding the coefficients of interest for the pre-electoral and post-inauguration indicators, they are insignificant across all specifications in both tables.

Furthermore, the results in table 4.5 can be compared to two previous studies on electoral cycles and violence in Italy. In particular, my findings stand in sharp contrast with the ones in Alesina et al. (2016b), who show a significant increase in the overall homicide rate during the pre-electoral period[52]. Also, even when there are important methodological differences, the general finding that homicides increase in the lame duck period, as compared to other months, is in line with the results in Daniele and Dippopa (2017) using local elections.

[50]This includes the month of the inauguration and the five after.

[51]I only report the overall effect of interest for the pre-electoral and post-inauguration periods for expository purposes.

[52]There can be a number of reasons for this, including the elections considered, the length of the sample, the definition of the pre-electoral period, the type of homicide, as well as the context of the country.

Table 4.5: Effect of elections on executions – Controlling for pre-electoral and post-inauguration periods

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Lame duck	-0.003	-0.024***	0.005	-0.038***	0.005	-0.048***
	(0.005)	(0.005)	(0.007)	(0.008)	(0.009)	(0.010)
Lame duck × Distance	0.012	0.031***	-0.001	0.040***	-0.000	0.051***
	(0.008)	(0.008)	(0.014)	(0.014)	(0.017)	(0.017)
Pre-electoral	0.018***		0.039***		0.048***	
	(0.006)		(0.010)		(0.013)	
Pre-electoral × Distance	-0.021***		-0.042***		-0.053***	
	(0.006)		(0.011)		(0.013)	
Post-inaug.		-0.028***		-0.054***		-0.068***
		(0.007)		(0.012)		(0.015)
Post-inaug. × Distance		0.018***		0.045***		0.056***
		(0.006)		(0.011)		(0.014)
Observations	29,852	29,852	29,852	29,852	29,852	29,852
Municipalities	2,004	2,004	2,004	2,004	2,004	2,004
Lame duck (Distance=1)	0.009	0.006	0.004	0.002	0.005	0.003
	(0.008)	(0.008)	(0.014)	(0.014)	(0.017)	(0.018)
Pre-electoral (Distance=1)	-0.003		-0.003		-0.005	
	(0.007)		(0.013)		(0.016)	
Post-inaug. (Distance=1)		-0.01		-0.009		-0.012
		(0.008)		(0.014)		(0.017)

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck', 'Pre-electoral' and 'Post-inaug.' are indicators of whether the month is in the lame duck period, in any of the 6 months before the election, and in any of the 6 months after the mayor has taken office (including the one in which she takes office), respectively. 'Lame duck' is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. All specifications control for a full set of municipality, year, and month fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Table 4.6: Effect of lame duck period on executions – Heterogeneous effects by winning party: Controlling for pre-electoral and post-inauguration periods

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: PAN wins						
Lame duck	-0.005	-0.028***	0.004	-0.042***	0.003	-0.053***
	(0.005)	(0.006)	(0.008)	(0.009)	(0.010)	(0.011)
Lame duck × Distance	0.020**	0.038***	0.022	0.060***	0.028	0.076***
	(0.010)	(0.010)	(0.017)	(0.017)	(0.021)	(0.021)
Lame duck × Distance× PAN	-0.025	-0.025	-0.091***	-0.072**	-0.113***	-0.092**
	(0.019)	(0.019)	(0.033)	(0.032)	(0.042)	(0.040)
Observations	28,413	28,413	28,413	28,413	28,413	28,413
Municipalities	1,907	1,907	1,907	1,907	1,907	1,907
Lame duck × Distance (PAN=1)	-0.009	-0.014	-0.065**	-0.054*	-0.081**	-0.068*
	(0.018)	(0.017)	(0.029)	(0.029)	(0.037)	(0.036)
Pre-electoral × Distance (PAN=1)	0.001		-0.019		-0.023	
	(0.013)		(0.026)		(0.032)	
Post-inaug. × Distance (PAN=1)		-0.011		0.004		0.002
		(0.015)		(0.028)		(0.034)
Panel B: PRI wins						
Lame duck	0.004	-0.018***	0.017*	-0.029***	0.021*	-0.037***
	(0.007)	(0.007)	(0.010)	(0.011)	(0.013)	(0.013)
Lame duck × Distance	-0.002	0.013	-0.036*	-0.001	-0.044*	-0.000
	(0.012)	(0.012)	(0.021)	(0.021)	(0.026)	(0.026)
Lame duck × Distance× PRI	0.029*	0.034**	0.066**	0.078***	0.083**	0.098***
	(0.016)	(0.016)	(0.028)	(0.028)	(0.035)	(0.035)
Observations	29,427	29,427	29,427	29,427	29,427	29,427
Municipalities	1,975	1,975	1,975	1,975	1,975	1,975
Lame duck × Distance (PRI=1)	0.031**	0.029**	0.048**	0.048**	0.060**	0.061**
	(0.013)	(0.013)	(0.021)	(0.021)	(0.027)	(0.026)
Pre-electoral × Distance (PRI=1)	-0.006		-0.005		-0.007	
	(0.010)		(0.018)		(0.022)	
Post-inaug. × Distance (PRI=1)		-0.011		-0.007		-0.009
		(0.010)		(0.018)		(0.022)

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. Columns 1, 3 and 5 control for an indicator of whether the month lies within the 6 months of pre-electoral period, while columns 2, 4 and 6 control for an indicator of whether the month lies within the 6 months of the post-inauguration period. 'Lame duck', 'Pre-electoral' and 'Post-inaug.' are indicators of whether the month is in the lame duck period, in any of the 6 months before the election, and in any of the 6 months after the mayor has taken office (including the one in which she takes office), respectively. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'PRI' is an indicator of whether the PRI wins the election. 'PAN' is defined in an analogous way. All specifications control for a full set of municipality, year and month fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Alternative interpretations

My results so far show that turf wars between DTOs—measured through executions—in valuable municipalities are more likely to occur during the lame duck period as compared to other periods of the electoral cycle. In section 4.1 I hypothesised that the reason for this is that the lame duck period represents a moment in which there are greater incentives to usurp territories as a consequence of the weakening of the incumbent DTOs. I next examine whether I can rule out other potential explanations for my findings.

Overall increase in homicides

A first alternative explanation refers to a possible increase in homicides during the lame duck period due to factors other than the electoral cycle. If this was the case, one would expect to see an increase in other types of DTO-related homicides, i.e. those as a result of aggressions and confrontations; or in other types of homicides, such as murders of politicians and journalists. Table 4.7 reports the results from considering these other homicides. Panel A focuses on aggressions,, panel B on confrontations, panel C on murders of politicians, while panel D on killings of journalists. In none of these four panels the coefficients of interest are significant. Moreover, their magnitude is very close to zero, regardless of whether the municipality is close to the US. In sum, the estimates show no support for this first alternative explanation.

Table 4.7: Effect of lame duck period on homicides – Different definitions of homicides

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Panel A: Aggressions						
Lame duck	0.00060	-0.00001	0.00124	0.00095	0.00146	0.00110
	(0.00073)	(0.00088)	(0.00155)	(0.00173)	(0.00185)	(0.00208)
Lame duck × Distance	-0.00088	-0.00098	-0.00085	-0.00118	-0.00088	-0.00128
	(0.00132)	(0.00134)	(0.00276)	(0.00280)	(0.00341)	(0.00346)
Panel B:Confrontations						
Lame duck	0.00095	0.00144	0.00273	0.00123	0.00333	0.00151
	(0.00139)	(0.00168)	(0.00209)	(0.00287)	(0.00256)	(0.00350)
Lame duck × Distance	-0.00125	-0.00145	-0.00101	-0.00168	-0.00102	-0.00183
	(0.00269)	(0.00275)	(0.00462)	(0.00478)	(0.00570)	(0.00590)
Panel C: Politicians						
Lame duck	-0.00012	-0.00011	-0.00018	-0.00003	-0.00023	-0.00004
	(0.00016)	(0.00016)	(0.00028)	(0.00024)	(0.00036)	(0.00031)
Lame duck × Distance	-0.00032	-0.00035	-0.00050	-0.00047	-0.00063	-0.00059
	(0.00023)	(0.00026)	(0.00042)	(0.00041)	(0.00053)	(0.00053)
Panel D: Journalists						
Lame duck	-0.00002	-0.00014	0.00007	-0.00001	0.00010	-0.00000
	(0.00009)	(0.00019)	(0.00009)	(0.00021)	(0.00012)	(0.00027)
Lame duck × Distance	0.00127	0.00126	0.00090	0.00090	0.00114	0.00114
	(0.00101)	(0.00102)	(0.00110)	(0.00112)	(0.00143)	(0.00145)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,852	29,852	29,852	29,852	29,852	29,852
Municipalities	2,004	2,004	2,004	2,004	2,004	2,004

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the US. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Political party turnover

The increase in homicides during the lame duck period could be due to the change in political party rather than in the government *per se* (Chicoine, 2017). To examine this I follow the same procedure as the one for the heterogeneous effects by the winning party. First, I interact the 'Lame duck' and 'Distance' variables with an indicator of

whether the incumbent loses the election (i.e. there is political party turnover). If this alternative explanation is in place, I should see executions to be significantly higher in municipalities with political party turnover as compared to those without. The results, which are presented in table 4.8, show no support for this. In particular, the coefficient associated with 'Lame duck × Distance× Turnover' reports an insignificant differential effect between both municipalities across all specifications.

Table 4.8: Effect of lame duck period on executions – Heterogeneous effects by political party turnover

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Lame duck	-0.004	-0.009	0.000	-0.005	0.000	-0.007
	(0.006)	(0.007)	(0.009)	(0.010)	(0.011)	(0.012)
Lame duck × Distance	0.022**	0.021*	0.025	0.023	0.032	0.029
	(0.011)	(0.011)	(0.019)	(0.018)	(0.023)	(0.023)
Lame duck × Distance × Turnover	0.004	0.004	-0.004	-0.005	-0.004	-0.006
	(0.015)	(0.015)	(0.026)	(0.026)	(0.032)	(0.032)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,175	29,175	29,175	29,175	29,175	29,175
Municipalities	1,958	1,958	1,958	1,958	1,958	1,958

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'Turnover' is an indicator of whether the incumbent party loses the election (i.e. there is political party turnover). All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

I next estimate the effect of political party turnover on executions using an RD design, as in equation 4.3. The running variable is the incumbent margin of victory, which is the share of votes obtained by the incumbent party minus the share of votes obtained by its strongest opponent, i.e. when the margin of victory is below zero it means that the incumbent party loses the election (i.e. there is political party turnover), while when it is above that it wins. I use elections occurring between 2004 and 2006 to identify the incumbent party for elections in 2007-2010 (see second column of table C1 for the specific

year for each state)[53]. Moreover, I remove two sets of observations. First, those in which the incumbent party does not run for re-election. Second, those in which there is only one party running for election (i.e. there is no competition). Details on the validity of the RD design can be found in the Appendix.

The RD estimates are reported in table C4. They show no significant effect, regardless of the definition of homicides and the polynomial order. Focusing on municipalities close to the US, the coefficient is always negative and insignificant. In sum, the findings in this section show no support for this second alternative explanation.

Greater enforcement

A final potential explanation is an intensification of enforcement by the lame duck government after elections. I do not have disaggregated information at the municipality level. However, several facts do not point in this direction. As mentioned in section 4.3, the come to power of President Felipe Calderón in December 2006 came with an unprecedented crackdown on drugs consisting of the deployment of a large number of military and police forces to dismantle DTOs (mainly through the arrest of kingpins). This started as soon as the President took office in December 2006 with the deployment of 6,700 agents in the state of Michoacán. In the two subsequent years, a total of eight 'Joint Operations'[54] were implemented. Although between 2009 and the end of the Calerón government new Joint Operations have been implemented, these have been at a much lower scale. Thus, the crackdown on drugs has been mainly concentrated on the first-half of the administration. Moreover, some argue that it was a mean to validate the electoral results given the narrow victory in the federal elections of 2006. In addition, the first Joint Operation in Michoacán was well received by the population (Guerrero-Gutiérrez, 2011). Taken together, this shows no support for a potential increase in enforcement in the latter stages of the administration, but rather to an increase in the earlier ones.

[53]For Yucatan I use elections in 2007 to identify the incumbent party in 2010.

[54]The crackdown on drugs has been implemented through what is called 'Joint Operations'. This mainly consists on the deployment of military and police agents to fight DTOs.

There is also evidence that this national strategy has been implemented more intensively in municipalities governed by a PAN mayor—same party as the federal government—[55]. It is important to mention that these operations are implemented upon a request from the mayor. Although there is no reason to suggest that these requests would have been larger during the lame duck period, I further examine this by estimating the differential impact of being in the lame duck period on executions in municipalities close to the US depending on whether the PAN is the incumbent party. If PAN mayors are more likely to make requests for implementing crackdowns than non-PAN mayors, homicides (which are the consequence of these crackdowns) should be higher when the incumbent is the PAN. Table 4.9 presents the results, which show no support for this third alternative explanation.

Table 4.9: Effect of lame duck period on executions – Heterogeneous effects by whether the PAN is the incumbent

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
Lame duck	-0.003	-0.008*	-0.001	-0.006	-0.002	-0.007
	(0.004)	(0.004)	(0.006)	(0.007)	(0.007)	(0.008)
Lame duck × Distance	0.024***	0.023**	0.022	0.019	0.029	0.025
	(0.009)	(0.009)	(0.015)	(0.015)	(0.019)	(0.019)
Lame duck × Distance × PAN inc	0.001	0.001	0.007	0.006	0.005	0.003
	(0.017)	(0.018)	(0.030)	(0.030)	(0.037)	(0.037)
Month fixed effects	No	Yes	No	Yes	No	Yes
Observations	29,472	29,472	29,472	29,472	29,472	29,472
Municipalities	1,978	1,978	1,978	1,978	1,978	1,978

Notes: This table estimates equation 4.2. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Distance' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'PAN inc' is an indicator of whether the PAN is the incumbent party. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

[55]Dell (2015) provides an excellent motivation, as well as evidence, for this.

4.7 Conclusion

In this paper I have examined whether turf wars are related with the electoral cycle. Using killings between DTOs as a proxy for turf wars, my results show a significant increase in the probability of having at least one homicide during the lame duck period as compared to other periods in municipalities close to the US. This is consistent with a hypothesis in which DTOs fight over valuable municipalities when the incumbent DTOs are relatively weaker. Incumbent DTOs are likely to be relatively weaker during the lame duck period since this represents a change in the *status quo*, including in the agreements between incumbent DTOs and the government. I have also provided evidence against alternative explanations.

Moreover, my results show that the increase in executions is concentrated on those municipalities in which the PRI wins. In particular, the effect on the probability of having at least one homicide is about 31% of the sample mean, while that on the homicide rate 35%. In contrast, the effect for municipalities in which the PAN wins is negative. This is consistent with an explanation in which DTOs do not attempt to gain control over territories that are expected to suffer a crackdown by the government, i.e. those governed by the same party as the federal government.

My results contribute to the understanding of the reasons behind the dramatic increase in violence since 2008. In particular, they highlight that the electoral cycle can help to explain the temporal variation in turf wars, which have been identified as an important source of violence. Even though my sample is restricted to December 2006-December 2010, the results are also relevant beyond this period since the situation of violence has not improved. Indeed, the year 2017 has been the most violent one since statistics are available (i.e. the 1990s).

Moreover, my results shed some light on how incentives of DTOs to dispute territories vary across the electoral cycle. In particular, they suggest that DTOs dispute territories when incumbent DTOs are relatively weaker as a consequence of political turnover. One

would not expect to observe this result if DTOs did not have the incentive to capture politicians during this period.

Chapter 5

Appendices

A Appendix: Chapter 2

Data

Definition of variables

Data comes from ENDIREH unless otherwise specified.

- **Income:** Income is defined as monthly regular labour income and includes wages, salaries, business and self-employed income. It refers to the employment that the person had during the week before the survey was conducted. Income is expressed in Mexican pesos[1] and has been converted into real terms using the National Consumer Price Index (NCPI) of the first fortnight of October of the corresponding year[2]. The base period for the NCPI corresponds to the second fortnight of December 2010.

  Income is top-coded in 2006 and 2011, such as the upper bound is 999,998 in 2006 and 96,000 in 2011. Top coded incomes are multiplied by 1.5, as commonly done in the literature (see Bertrand et al. (2015) for example). I also remove couples where both partners earn top-coded incomes, since this would lead to a peak in a relative income equal to 0.5. The fact that income is top coded can introduce a censoring problem if the number of top-coding cases is large. This is, however, not the case in my sample, where only 0.3% of individuals have a top-coded income.

- **Instrumental variable:** The IV is constructed using data from ENE and ENOE. The income component of the instrument is defined using 12-months of data from the last quarter of the year before the ENDIREH survey (i.e. 2002, 2005 and 2010) and the first three quarters of the ENDIREH survey year (i.e. 2003, 2006 and 2010). As a robustness check, I employ the calendar years of 2003, 2006 and 2011. The income information refers to the employment that the person had during the week

[1] 1 British Pound is approximately 23 Mexican Pesos

[2] I have chosen the first fortnight of October because it closely matches the ENDIREH data collection period, which was between early October and early November.

before the survey was conducted. It is defined as monthly regular labour income and includes wages, salaries, business and self-employed income. It has been converted in real terms using the National Consumer Price Index, as explained above.

The industry share component of the instrument is constructed using information of the last quarter of 2002 and the first three quarters of 2003. As a robustness check, I employ information on one year before, that is, the last quarter of 2001 and the first three quarters of 2002.

- **Age:** I restrict the age of women and men to range between 15 and 64 and define three variables. First, a continuous measure, which is given in years. Second, a categorical variable with five categories (15-24, 25-34, 35-44, 45-54, 55-64). These categories coincide with those used in the definition of the instrument. Third, the square of the continuous measure of age.

- **Indigenous:** Indigenous refers to whether the woman or her partner are part of an indigenous group. It is measured as a dichotomous variable equal to one if the woman (man) speaks an indigenous language and zero otherwise. Although measuring indigenous status by the language proficiency is not accurate (e.g. individuals could be indigenous, but not speak their original language), it is the usual way in which indigenous groups are identified in Mexican surveys. I control for this as it is usually argued that IPV is common in Mexican indigenous communities given their more traditional cultural beliefs and customs (Oehmichen, 2010).

- **Education:** Education refers to the maximum level of education reached. I construct a categorical variable with four categories, namely incomplete primary, complete primary, complete secondary and complete middle-higher (i.e. finished A levels, technical vocational training or university studies). These four categories are the same ones than those used in the construction of the instrument.

- **Violence in childhood:** Woman's experience of violence in her childhood is a dichotomous variable equal to one if the woman experienced either physical or emo-

tional abuse before the age of 13 in her family of origin and zero otherwise. There is a large body of literature in favour of the inter-generational transmission of IPV (Franklin and Kercher, 2012; Pollak, 2004).

- **Couple's total income:** The couple's total income is the sum of both partners' income expressed in Mexican pesos. I employ the natural logarithm of this variable.

- **Marital status:** Marital status is a dichotomous variable equal to one if the woman is married and zero if she is cohabiting.

- **Length of relationship:** The length of the relationship is the number of years that the couple has been living together.

- **Number of young children:** The number of young children is defined as the number of children below the age of 6 living in the household.

- **Extended family:** Extended family is an indicator of whether the couple lives with other individuals in the household. In other papers extended family captures whether the family is nuclear (i.e. lives with their children). However, I expect that both children and other members, such as parents, have an impact on violence.

- **Urban residence:** Urban residence is measured as a dichotomous variable equal to one if the household is located in an urban area and zero if in a rural. Mexican surveys and censuses define a rural area as that with less than 2,500 inhabitants.

- **Socio-Economic Status index:** The SES index captures the household living standard (see details of its construction below).

- **Male's homicide rate:** The homicide rate is measured as the annual number of intentional homicides per 100,000 inhabitants in the year of the survey. Homicides refers to the year and state of occurrence. Data for homicides come from death certificates, while for population from CONAPO (*Consejo Nacional de Población*)

[National Council of Population]. I exclude female homicides because this would also include intimate partner homicides, which are likely to be endogenous[3].

The male's homicide rate serves as a proxy for the general level of violence, which has varied dramatically across states over my time span. In particular, some regions of the country have experienced a boost in homicides since 2007, which previous papers have found to be associated with the 'war on drugs' initiated by the former President Felipe Calderón (Dell, 2015). Women living in more violent states could have stopped working due to insecurity. Also, men living in these areas might be more prone to inflict IPV given the likely higher tolerance for it.

- **Impunity rate for homicides:** The impunity rate for homicides is defined as one minus the ratio between the total number of convictions for intentional homicide that receive a guilty verdict and the total number of intentional homicides in a given year and state. 'Year' refers to the year that the homicide was registered in the Public Ministry, whereas 'state' to the state in which it occurred. In order to make both parts of the ratio comparable, this measure includes all homicides, regardless of the victim's sex and the offender-victim relationship. Data are from the judicial statistics in penal matters.

  This measure serves as a proxy for the efficiency of the criminal justice system. One would expect that, if the criminal justice system is more efficient, there would be a decrease in IPV due to deterrence.

- **Unemployment rate:** The unemployment rate is measured as the ratio of the unemployed population to the economically active population and refers to the calendar year of the ENDIREH survey. Data is obtained from ENE and ENOE surveys. It serves as a proxy for the economic conditions in the state.

- **Migration rate:** The migration rate is defined by state, year and age group. It

[3]Whether the homicide has been committed by an intimate partner cannot be identified in most of the cases.

is the number of female (male) emigrants and immigrants as a percentage of the population. Migration and population data are obtained from CONAPO.

Construction of the Socio-Economic Status index

SES indices have been increasingly employed in the literature to measure the standard of living of the households as an alternative to income and expenditure measures (Falkingham and Namazie, 2002; Vyas and Kumaranayake, 2006). To construct the SES index I follow two steps. First, I select the variables and, then, I compute the index as a weighted sum of them. In order to obtain the weights, I use Principal Component Analysis (PCA), as done in Filmer and Pritchett (2001) and McKenzie (2005).

I have data on access to utilities and infrastructure (floor material, water source, drainage system and number of rooms for sleeping), ownership of durable assets (radio, TV, video cassette recorder, telephone line, fridge, washing machine, water boiler, automobile or truck, house and land) and number of residents. I use the number of residents and the number of rooms for sleeping to construct a crowding index, which is measured as the ratio of the former to the latter. Regarding the variables that have several categories, I re-code them into binary variables, since otherwise they would be converted into a continuous scale with no meaning. Table A1 presents the descriptive statistics of the 26 variables included.

When the frequency of two similar variables is low, I decide to exclude them (i.e. piped water from public tap, piped water from another dwelling, tank water, pipe to ravine and pipe to river). I also remove the variable 'floor: earth' in order to avoid a perfect linear combination of the floor-related variables[4]. The resulting total number of variables has been reduced from 26 to 20 (19 binary variables and one continuous). Finally, I exclude all women with missing values in at least one of the variables.

Once the variables have been selected, the second step to construct the SES index

[4]This is not a problem with the variables related to 'source of water' and 'drainage system', since I have already excluded one of them in each category. I choose to remove 'earth' because it is less frequent and has less variation than 'cement' and 'wood'.

Table A1: Descriptive statistics of SES variables

	Mean	SD	Min	Max
Floor: Earth	0.055	0.229	0.000	1.000
Floor: Cement	0.541	0.498	0.000	1.000
Floor: Wood	0.403	0.491	0.000	1.000
Water: Piped water from inside the house	0.782	0.413	0.000	1.000
Water: Piped water from outside the house	0.139	0.346	0.000	1.000
Water: Piped water from public tap	0.009	0.092	0.000	1.000
Water: Piped water from another dwelling	0.010	0.100	0.000	1.000
Water: Tank water	0.012	0.108	0.000	1.000
Water: Well, river, stream, lake	0.048	0.214	0.000	1.000
Drainage: Sewer	0.730	0.444	0.000	1.000
Drainage: Septic tank	0.197	0.398	0.000	1.000
Drainage: Pipe to ravine	0.010	0.098	0.000	1.000
Drainage: Pipe to river, lake, see	0.004	0.064	0.000	1.000
Drainage: No drainage	0.059	0.236	0.000	1.000
Assets: Radio	0.827	0.378	0.000	1.000
Assets: Television	0.961	0.194	0.000	1.000
Assets: Videocassette	0.605	0.489	0.000	1.000
Assets: Computer	0.303	0.460	0.000	1.000
Assets: Telephone	0.486	0.500	0.000	1.000
Assets: Fridge	0.873	0.333	0.000	1.000
Assets: Washing machine	0.736	0.441	0.000	1.000
Assets: Water boiler	0.455	0.498	0.000	1.000
Assets: Automobile	0.471	0.499	0.000	1.000
Assets: House	0.704	0.456	0.000	1.000
Assets: Land	0.162	0.369	0.000	1.000
Crowding index	2.559	1.375	0.200	19.000

Notes: 'SD' for standard deviation, 'Min' for minimum value and 'Max' for maximum value.

is to assign weights to each of them using PCA. For doing so, I need to choose the number of principal components to retain for rotation. The common practice in the SES literature has been to retain only the first one on the empirical basis that it provides a good estimation of the SES of the household (Filmer and Pritchett, 2001; McKenzie, 2005). This is the approach adopted here. The eigenvalue of the first component is 5.2 and explains 26% of the variation in the data. This is a low number, but it is in line with other studies on the topic (Vyas and Kumaranayake, 2006). The loadings resulting from the first principal component are shown in table A2. In general, a variable with a positive weight is associated with a higher SES, while a variable with a negative weight with a

lower one. The sign of the loadings is as one might expect. In addition, the Cronbach's alpha[5] is 0.80, which suggests that the index has a relatively good internal consistency.

Using the loadings from the first principal component I construct the SES index for each household. Concretely, I multiply each variable by its weight and sum across them. I classify the households into three groups based on their SES value, namely the lowest 40% as 'low', the highest 20% as 'high' and the rest as 'middle'.

Table A2: PCA loadings of SES variables

	Loadings
Floor: Cement	-0.214
Floor: Wood	0.283
Water: Piped water from inside the house	0.304
Water: Piped water from outside the house	-0.224
Water: Well, river, stream, lake	-0.154
Drainage: Sewer	0.273
Drainage: Septic tank	-0.180
Drainage: No drainage	-0.186
Assets: Radio	0.133
Assets: Television	0.166
Assets: Videocassette	0.247
Assets: Computer	0.258
Assets: Telephone	0.273
Assets: Fridge	0.241
Assets: Washing machine	0.252
Assets: Water boiler	0.290
Assets: Automobile	0.234
Assets: House	0.038
Assets: Land	-0.035
Crowding index	-0.239

[5]The Cronbach's alpha is a measure of internal consistency, that is, the extent to which the items included in the scale measure the same concept. In most social science applications, a reliability coefficient higher than 0.70 is considered acceptable.

Supplementary tables

Table A3: Prevalence of IPV by violent item

	All	2003	2006	2011
During the last year, has your husband or partner...				
Physical IPV				
pushed you or pulled your hair?	0.059	0.063	0.077	0.040
tied you up?	0.001	0.001	0.002	0.001
kicked you?	0.015	0.018	0.020	0.009
thrown any object at you?	0.024	0.024	0.032	0.017
beaten you with his hands or any object?	0.047	0.047	0.056	0.038
tried to hang or choke you?	0.009	0.010	0.010	0.007
assaulted you with a knife or blade?	0.004	0.006	0.004	0.003
fired a weapon at you?	0.001	0.001	0.001	0.000
threatened you with a weapon?	0.006	0.012	0.006	0.005
threatened to kill you, himself or the children?	0.017	0.024	0.016	0.015
Sexual IPV				
demanded you to have sexual relations?	0.043	0.066	0.052	0.027
forced you to do sexual things that you do not like?	0.014	0.020	0.015	0.010
used physical strength to force you to have sexual relations?	0.015	0.021	0.017	0.011
Emotional IPV				
ashamed, underestimated or humiliated you?	0.076	0.081	0.072	0.080
ignored or not shown you affection?	0.100	0.087	0.101	0.103
said you cheat on him?	0.073	0.070	0.075	0.072
made you feel fear?	0.062	0.078	0.062	0.056
threatened to leave you, hurt you, take your children away or kick you out?	0.070	0.088	0.070	0.064
locked you in, forbidden you from going out or being visited?	0.028	0.034	0.029	0.024
turned your children or relatives against you?	0.027	0.041	0.025	0.023
destroyed, thrown away or hidden things belonging to you or the household?	0.033	0.045	0.033	0.028
sopped talking to you?	0.192	0.176	0.209	0.181
got angry because household chores are not done or not like he wants?	0.103	0.106	0.113	0.092
Economic IPV				
complained about how you spend money?	0.125	0.140	0.133	0.112
been stingy with the household expenses, even though he has money?	0.075	0.078	0.076	0.073
not given you the upkeep or threatened you to not giving it?	0.044	0.054	0.044	0.040
spent money needed for the household?	0.062	0.084	0.065	0.052
appropriated or taken money or possessions from you?	0.009	0.011	0.009	0.009
forbidden you to work or study?	0.076	0.110	0.082	0.058
Observations	136,818	20,327	57,672	58,819

Table A4: First stage of 2SLS

	(1)	(2)	(3)	(4)	(5)
	Income in ln			Income in levels	
	Income woman	Income man	Relative income		
Woman's predicted income	1.191***				
	(0.166)				
Man's predicted income		0.619***			
		(0.091)			
Predicted relative income (ln)			0.199***		
			(0.027)		
Predicted relative income (levels)				0.187***	0.105***
				(0.023)	(0.006)
Extremes	No	No	No	No	Yes
Observations	136,818	136,818	136,818	136,818	136,818

Notes: OLS estimates reported. Robust standard errors clustered at the state level in parentheses. The dependent variable is the natural logarithm of woman's income (column 1), the natural logarithm of man's income (column 2) and the woman's relative income (columns 3-5). Columns 1-3 define the income used to construct the IV in natural logarithms, while columns 4-5 in levels. 'Extremes' includes two indicators of whether the woman's relative income is zero and whether it is one. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, and state and year fixed effects. Specifications 3-5 also control for the couple's total income. ***significant at 1% level, **at 5%, *at 10%.

Table A5: Survey respondent of the income question and women's relative income

	(1)	(2)	(3)
Respondent woman	-0.016***		
	(0.002)		
Respondent man		0.017***	
		(0.004)	
Respondent other			0.012***
			(0.003)
Observations	58,819	58,819	58,819

Notes: OLS estimates reported. Robust standard errors clustered at the state level in parentheses. The sample is restricted to the year 2011. The dependent variable is an indicator of whether the woman has a relative income equal to 0.5. All specifications control for both partners' age (continuous and five categories), the square of age, both partners' indigenous background, both partners' educational attainment (four categories), woman's experience of violence in her childhood, couple's total income, marital status, length of the relationship, number of young children, whether the couple lives alone, urban residence, SES index, whether more than one woman was interviewed in the household, state fixed effects, and two indicators of whether woman's relative income is zero or one. ***significant at 1% level, **at 5%, *at 10%.

B Appendix: Chapter 3

Data

Definition of covariates

Unless otherwise specified, data are obtained from ENDIREH.

- **Age:** Number of years.
- **Indigenous:** Dichotomous variable equal to one if the woman (man) speaks an indigenous language and zero otherwise.
- **Education:** Educational attainment is measured as the maximum level of education reached by using a categorical variable with four categories. It is equal to one if the woman (man) has not completed primary education; equal to two if she (he) has finished primary education; equal to three if she (he) has completed secondary education, A levels or technical vocational training; and equal to four if she (he) has finished any of the courses considered part of higher education (undergraduate or postgraduate studies).
- **Violence in childhood:** Indicator of whether the woman experienced either physical or emotional abuse before the age of 13 in her family of origin.
- **Length of relationship:** Number of years that the spouses have been living together.
- **Number of young children:** Number of children below 6 that the couple has.
- **Urban residence:** Dichotomous variable equal to one if the household is located in an urban area and zero if in a rural.

- **Socio-Economic Status:** The SES index captures the household living standard by considering variables related to dwelling infrastructure and access to utilities, household ownership of durable assets and number of residents (see details below).

- **Male Homicide rate:** The homicide rate is measured as the number of intentional homicides per 100,000 inhabitants. Data for homicides come from death certificates and for population from CONAPO *(Consejo Nacional de Población)* [National Council of Population].

- **Unemployment rate:** The unemployment rate is measured as the ratio of the unemployed population to the economically active population. Data are obtained from ENOE *(Encuesta Nacional de Ocupación y Empleo)* and ENE *(Encuesta Nacional de Empleo)* [National Labour Force Survey].

Construction of the Socio-Economic Status index

This section briefly explains the construction of the household SES index[6]. The SES index groups a wide range of variables that capture the household living standard (26 in total). In order to construct this index I follow several steps. First, I convert each categorical variable into a dichotomous one. Second, I exclude variables that have a very low frequency and are conceptually similar to others with higher frequency. Third, I remove specific variables in order to avoid perfect linear combinations of them. Fourth, I drop women with missing values in any of the variables. After all these adjustments, I end up with 20 variables. The index is constructed as the weighted sum of all them in which the weights are the loadings of the first principal component obtained from conducting a principal component analysis. Households are then classified into three groups according to the value of the index. Households in the lowest 40% of the distribution are classified as 'low', in the highest 20% as 'high' and in the rest as 'middle'.

[6]See Garcia-Ramos (2017) for a detailed explanation of it.

Woman's decision-making power

For constructing the woman's absolute decision-making power, I first recode each decision as one if the woman makes it alone and zero otherwise[7]. The index is then constructed as the sum of the number of decisions made by the woman alone, which I re-scale to range between zero and one. Thus, it should be interpreted as the proportion of decisions made by her alone. The woman's relative decision-making power is defined as the proportion of decisions made by the woman alone minus the proportion of decisions made by the man alone.

[7]It could be that, however, the woman reports that she makes the decision alone, but she is influenced by her partner or, if he disagrees, it is him who actually has the final say. I have information on whether he complains if she makes the decision alone, but not on what occurs if he does. Even though, the fact that only 8% of women in 2006 and 2011 (no information for 2003) report that he complains provides confidence for the idea that a woman's decision when taken alone is usually respected.

Supplementary tables

Table B1: Divorce/Domestic Violence Laws and Representative sample in 2003

State	(1) U	(2) U year	(3) MC (judicial)	(4) MC (adm)	(5) DV Divorce	(6) DV Penal Code	(7) DV Law	(8) Rep.
Central								
Mexico City	08/2008	yes	yes/no	yes	yes	yes	01/2008	no
Guanajuato			yes	no	06/2008	yes	11/2010	no
Hidalgo	03/2011	no	yes/yes(1)	no	no	yes	12/2007	yes
México	05/2012	yes	yes/yes	yes	01/2007	yes	11/2008	no
Morelos			yes	yes	09/2006	06/2006	12/2007	no
Puebla			yes	yes	11/2007	yes	11/2007	no
Querétaro	04/2016	no	yes	yes	2008	02/2008	03/2009	no
Tlaxcala			yes	yes	01/2006	12/2013	12/2007	no
North								
Aguascalientes	06/2015	yes	yes/no	yes	yes	02/2004	11/2007	no
Baja California			yes	yes	11/2004	yes	06/2008	yes
Baja California Sur			yes	yes	yes	03/2005	03/2008	no
Coahuila	04/2013	yes	yes/yes	12/2006	yes	yes	07/2008	yes
Chihuahua			yes	yes	yes	yes	01/2007	yes
Durango			yes	yes	yes	04/2004	11/2007	no
Nuevo León			yes	yes	yes	yes	09/2007	yes
San Luis Potosí			yes	yes	yes	yes	08/2007	no
Sinaloa	02/2013	no	yes/yes(1)	yes	yes	yes	07/2007	no
Sonora			yes	no	yes	yes	10/2007	yes
Tamaulipas			yes	yes	yes	yes	08/2007	no
Zacatecas			yes	no	yes	yes	01/2009	yes
West								
Colima			yes	yes	yes	11/2005	11/2008	no
Jalisco			yes	yes	11/2007	yes	05/2008	no
Michoacán			yes	yes	yes	yes	12/2008	yes
Nayarit	05/2014	no	yes/yes	yes	05/2007	12/2004	11/2008	no
East and South								
Campeche			yes	yes	06/2007	12/2014	07/2007	no
Chiapas			yes	yes	11/04	yes	03/2009	yes
Guerrero	03/2012	yes	yes/yes	yes	yes	yes	02/2008	no
Oaxaca	04/2017	no	yes/no	yes	yes	yes	03/2009	no
Quintana Roo	05/2013(2)	yes	yes/yes	yes	07/2004	06/2006	11/2007	yes
Tabasco			yes	yes	12/2008	yes	12/2008	no
Veracruz			yes	yes	yes	11/2003	02/2008	no
Yucatán	06/2015	yes	yes/yes	yes	no	yes	03/2008	yes

Notes: Column 1 refers to the date unilateral divorce was approved and column 2 to whether there is a one-year marriage requirement. If unilateral divorce has not been introduced these two columns are in blank. Column 3 refers to whether there was/is mutual consent divorce by judicial procedure (when unilateral divorce has been introduced, the first term refers to before its implementation and the second to after). Column 4 refers to whether there is administrative divorce. Column 5 refers to whether domestic violence was/is explicitly recognised as a cause for divorce. If it was before 20th October 2003 (when the data collection for ENDIREH 2003 started), it says 'yes'. Columns 6 refers to whether domestic violence has been recognised in the Penal Code. If it was before 20th October 2003, it says 'yes'. Column 7 refers to the date in which the Law on Women's Access to a Life Free of Violence was adopted. Column 8 states whether the sample was representative in ENDIREH 2003. 'U' and 'MC' stand for unilateral and mutual consent, respectively, 'adm' for administrative, 'DV' for domestic violence and 'Rep' for representative.

(1) Do not require a mandatory one-year of marriage after the introduction of unilateral divorce.

(2) Quintana Roo continuous to have fault divorce on its Civil Code after introducing unilateral divorce.

Source: Own elaboration based on Civil Codes, Codes of Civil Procedures, Family Codes, Codes of Family Procedures, Family Laws and Divorce Laws (columns 1-5); Penal Codes (column 6); Law on Women's Access to a Life Free of Violence (column 7) and ENDIREH (column 8).

Table B2: Prevalence of IPV by violent item

	2003		2006		2011	
	T	C	T	C	T	C
During the last year, has your husband or partner...						
Physical IPV and serious threats						
pushed you or pulled your hair?	0.047	0.046	0.074	0.059	0.027	0.032
tied you up?	0.000	0.001	0.003	0.002	0.000	0.001
kicked you?	0.015	0.012	0.020	0.016	0.006	0.006
thrown any object at you?	0.011	0.020	0.030	0.025	0.009	0.013
beaten you with his hands or any object?	0.043	0.036	0.050	0.044	0.032	0.028
tried to hang or choke you?	0.004	0.007	0.010	0.007	0.003	0.004
assaulted you with a knife or blade?	0.001	0.004	0.005	0.004	0.002	0.002
fired a weapon at you?	0.000	0.001	0.002	0.001	0.000	0.001
threatened you with a weapon?	0.008	0.011	0.006	0.006	0.005	0.004
threatened to kill you, himself or the children?	0.023	0.020	0.010	0.012	0.005	0.011
Sexual IPV						
demanded you to have sexual relations?	0.066	0.061	0.056	0.046	0.013	0.024
forced you to do sexual things that you do not like?	0.011	0.018	0.014	0.010	0.004	0.008
used physical strength to force you to have sexual relations?	0.015	0.019	0.018	0.014	0.006	0.008
Emotional IPV						
ashamed, underestimated or humiliated you?	0.109	0.073	0.073	0.056	0.058	0.058
ignored or not shown you affection?	0.124	0.082	0.111	0.076	0.085	0.081
said you cheat on him?	0.084	0.057	0.063	0.050	0.039	0.050
made you feel fear?	0.075	0.071	0.059	0.047	0.037	0.038
threatened to leave you, hurt you, take your children away or kick you out?	0.082	0.068	0.054	0.046	0.033	0.048
locked you in, forbidden you from going out or being visited?	0.031	0.030	0.023	0.023	0.013	0.017
turned your children or relatives against you?	0.039	0.037	0.031	0.019	0.016	0.019
destroyed, thrown away or hidden things belonging to you or the household?	0.052	0.035	0.030	0.027	0.012	0.022
sopped talking to you?	0.177	0.155	0.194	0.166	0.179	0.133
got angry because household chores are not done like he wants?	0.110	0.094	0.099	0.083	0.071	0.070
Economic IPV						
complained about how you spend money?	0.108	0.118	0.124	0.090	0.081	0.080
been stingy with the household expenses, even though he has money?	0.098	0.070	0.088	0.062	0.046	0.054
not given you the upkeep or threatened you to not giving it?	0.062	0.045	0.042	0.038	0.027	0.031
spent money needed for the household?	0.075	0.069	0.061	0.053	0.022	0.040
appropriated or taken money or possessions from you?	0.012	0.010	0.008	0.007	0.006	0.008
forbidden you to work or study?	0.096	0.090	0.063	0.054	0.028	0.038
Observations	1,618	14,519	3,285	16,178	3,489	16,504

Notes: 'T' stands for treatment and 'C' for control. Sampling weights are applied.

Table B3: Effect of easier divorce on being divorced

	(1)	(2)	(3)
Treat × Post	0.009*	0.008*	0.007*
	(0.004)	(0.004)	(0.004)
State/Year FE	Yes	Yes	Yes
Individual	No	Yes	Yes
Household	No	No	Yes
Observations	101,056	101,056	101,056

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Sampling weights are applied. 'FE' stands for fixed effects. The sample includes all women (i.e. married, cohabiting, divorced, separated, in a relationship, single). The dependent variable is an indicator of whether the woman is divorced. Individual covariates include woman's age, woman's indigenous background and woman's educational attainment. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

Table B4: Exogeneity of the reform

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Physical 06	-0.491	-1.466						
	(0.499)	(2.328)						
Physical 03	-0.583	-0.769						
	(0.542)	(1.467)						
Sexual 06			0.269	-0.041				
			(0.716)	(3.456)				
Sexual 03			0.106	-0.307				
			(0.548)	(1.400)				
Emotional 06					0.029	-1.101		
					(0.505)	(1.183)		
Emotional 03					0.017	-0.511		
					(0.424)	(0.711)		
Economic 06							-0.022	-0.171
							(0.269)	(0.862)
Economic 03							-0.044	-0.290
							(0.206)	(0.518)
Age_w		0.038		0.005		0.047		0.009
		(0.115)		(0.112)		(0.121)		(0.104)
Age_m		0.082		0.113		0.088		0.118
		(0.100)		(0.103)		(0.091)		(0.090)
Indigenous_w		6.956		6.911		7.413		7.667
		(4.910)		(4.287)		(5.437)		(4.961)
Indigenous_m		-6.216		-6.160		-6.709		-6.915
		(4.455)		(3.830)		(5.011)		(4.496)
Primary edu_w		-0.644		-0.668		-0.366		-0.510
		(1.279)		(1.257)		(1.344)		(1.205)
Secondary edu_w		-1.716		-1.812		-1.456		-1.736
		(2.163)		(2.232)		(2.242)		(2.027)
Higher edu_w		-4.662		-4.896		-4.859		-4.790
		(3.005)		(2.938)		(2.966)		(2.876)
Primary edu_m		1.346		1.233		1.495		1.285
		(1.412)		(1.449)		(1.456)		(1.458)
Secondary edu_m		3.044		2.957		3.166		3.027
		(2.335)		(2.435)		(2.401)		(2.444)
Higher edu_m		4.982		4.955		5.243		4.993
		(3.780)		(3.913)		(3.757)		(3.812)
Child violence		-0.097		-0.382		0.064		-0.418
		(0.371)		(0.454)		(0.424)		(0.456)
Length relation		-0.038		-0.039		-0.041		-0.046
		(0.075)		(0.074)		(0.080)		(0.077)
Young children		-0.031		-0.072		0.172		-0.003
		(0.749)		(0.745)		(0.729)		(0.828)
Urban		-0.556		-0.488		-0.469		-0.455
		(0.644)		(0.626)		(0.574)		(0.593)
SES middle		-0.074		-0.036		-0.248		-0.132
		(0.800)		(0.689)		(0.962)		(0.754)
SES high		0.011		0.101		0.033		0.071
		(0.524)		(0.579)		(0.549)		(0.595)
Constant	0.107	-4.828	0.052	-4.779	0.057	-5.789	0.071	-5.119
	(0.082)	(3.157)	(0.052)	(3.050)	(0.114)	(3.704)	(0.073)	(3.423)
Observations	64	64	64	64	64	64	64	64

Notes: OLS estimates reported. Robust standard errors clustered at the state level in parentheses. 'edu' stands for education, 'w' for woman, 'm' for man, '03' for 2003 and '06' for 2006. The sample includes women who are married. All the variables are weighted averages of the ENDIREH sample by state and year. The dependent variable is an indicator of whether the state has introduced unilateral divorce by 2011. ***significant at 1% level, **at 5%, *at 10%.

Table B5: Effect of easier divorce on IPV – Additional robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Alternative control groups					Married >10 years
		All	Divorce +Criminal	Abortion MC	Abortion Const.	Late reform	
Physical	-0.003	0.004	0.000	-0.004	0.001	-0.006	-0.003
	(0.007)	(0.007)	(0.007)	(0.008)	(0.009)	(0.008)	(0.007)
Sexual	-0.017***	-0.011***	-0.012***	-0.020***	-0.010**	-0.014**	-0.022***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)	(0.004)
Emotional	-0.049***	-0.037***	-0.044***	-0.051***	-0.036***	-0.048***	-0.038***
	(0.007)	(0.009)	(0.008)	(0.010)	(0.009)	(0.009)	(0.007)
Economic	-0.043***	-0.033***	-0.034***	-0.045***	-0.023**	-0.041***	-0.057***
	(0.007)	(0.007)	(0.006)	(0.007)	(0.008)	(0.006)	(0.011)
Observations	55,593	141,644	61,851	42,048	38,814	37,760	40,530

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. Column 1 reproduces the baseline estimates from table 3.2. Column 2 considers all non-reform states (i.e. 30) as control group. Column 3 excludes from all these non-reform states those that have reformed their divorce and criminal legislations and, in addition to this, column 4 excludes women who are not likely to have benefited from the decriminalisation of abortion in Mexico City, column 5 removes states that have introduced constitutional changes to protect the right to life from conception or fertilisation, and column 6 excludes states that have introduced unilateral divorce after 2011. Column 7 defines the treatment group as women married for at least 10 years at the time of the reform living in Mexico City or Hidalgo. 'MC' stands for Mexico City and 'Const' for constitutional. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

Table B6: Effect of easier divorce on IPV – Wild cluster bootstrapped standard errors

	(1)	(2)	(3)	(4)
Physical	-0.007	-0.003	-0.004	-0.003
	(0.009)	(0.008)	(0.008)	(0.008)
Sexual	-0.019***	-0.017***	-0.017***	-0.017***
	(0.006)	(0.006)	(0.005)	(0.005)
Emotional	-0.058***	-0.050***	-0.051***	-0.049***
	(0.019)	(0.016)	(0.016)	(0.016)
Economic	-0.048***	-0.044***	-0.044***	-0.043***
	(0.016)	(0.014)	(0.014)	(0.014)
State/Year FE	Yes	Yes	Yes	Yes
Individual	No	Yes	Yes	Yes
Couple	No	No	Yes	Yes
Household	No	No	No	Yes
Observations	55,593	55,593	55,593	55,593

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Wild cluster bootstrapped standard errors in parentheses. Sampling weights are applied. 'FE' stands for fixed effects. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. Individual covariates include both partners' age, both partners' indigenous background, both partners' educational attainment and woman's experience of violence in her childhood. Couple covariates include length of the relationship and number of young children. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

Table B7: Effect of easier divorce on IPV – Man's experience of violence in childhood

	(1)	(2)	(3)	(4)	(5)
	LPM				Probit
Physical	-0.009	-0.006	-0.007	-0.006	-0.004
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)
Sexual	-0.021***	-0.019***	-0.019***	-0.018***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)
Emotional	-0.064***	-0.056***	-0.057***	-0.055***	-0.042***
	(0.013)	(0.011)	(0.011)	(0.011)	(0.008)
Economic	-0.054***	-0.050***	-0.050***	-0.049***	-0.040***
	(0.013)	(0.011)	(0.011)	(0.011)	(0.009)
State/Year FE	Yes	Yes	Yes	Yes	Yes
Individual	No	Yes	Yes	Yes	Yes
Couple	No	No	Yes	Yes	Yes
Household	No	No	No	Yes	Yes
Observations	46,609	46,609	46,609	46,609	46,609

Notes: OLS estimates (columns 1-4) and marginal effects (column 5) associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'FE' stands for fixed effects. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The sample excludes missing values of the variable man's experience of violence in childhood. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. Individual covariates include both partners' age, both partners' indigenous background, both partners' educational attainment and woman's experience of violence in her childhood. Couple covariates include length of the relationship and number of young children. Household covariates include urban residence and SES index. ***significant at 1% level, **at 5%, *at 10%.

Table B8: Effect of easier divorce on reporting behaviour

	(1)	(2)	(3)
	Ordinary LPM	Selection equation	Heckman
Violence childhood man		0.417***	
		(0.031)	
Treat × Post	-0.006		-0.008
	(0.017)		(0.018)
Wald test (p-value)			0.000
Observations	10,641	46,146	46,146

Notes: Column 1 reports the OLS estimate associated with the variable $Treat \times Post$ when an ordinary LPM is estimated. Column 2 reports the Probit estimate associated with the selection variable 'Violence childhood man' and column 3 the maximum likelihood estimate associated with the variable $Treat \times Post$ when a Heckman selection model is estimated. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Wald test' refers to the test of independent equations. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The sample in column 1 is restricted to women who have experienced IPV in the 12 months prior to the survey. The smaller number of observations in columns 2 and 3 compared to the baseline specification in table 3.2 is due to the missing values in the variables man's experience of violence in childhood and report of IPV to the police or any other authority. The dependent variable is an indicator of whether the woman has reported IPV to the police, Public Ministry or any other authority (columns 1 and 3); or an indicator of whether her husband has experienced IPV in his childhood (column 2). All specifications control for both partners' age, both partners' indigenous background, both partners' educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

Table B9: Effect of easier divorce on physical IPV – Heterogeneous effects

	(1)	(2)	(3)	(4)	(5)
	Ind_w	Ind_m	Children	Urban	SES
Treat × Post	-0.003	-0.003	-0.005	-0.001	-0.006
	(0.010)	(0.010)	(0.005)	(0.007)	(0.007)
Treat× Post × Ind_w	0.010				
	(0.055)				
Treat× Post × Ind_m		-0.009			
		(0.035)			
Treat× Post × Children			0.017		
			(0.012)		
Treat× Post × Urban				0.000	
				(0.008)	
Treat× Post × SES (Middle)					0.006
					(0.018)
Treat× Post × SES (High)					-0.004
					(0.008)
Observations	55,593	55,593	55,593	55,593	55,593

Notes: OLS estimates associated with the variable $Treat \times Post$ reported. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Ind_w (Ind_w)' refers to whether the woman (man) is indigenous, '$Children$' to whether the woman has young children, '$Urban$' to whether the couple lives in an urban area, and 'SES' to the SES index. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced physical IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, woman's educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

Table B10: Effect of easier divorce on IPV – Heterogeneous effects by husband's education: Alternative definition of physical and sexual IPV

	(1)	(2)	(3)	(4)	(5)	(6)
	Physical (no emo and eco)	Physical (no emo)	Physical (no eco)	Sexual (no emo and eco)	Sexual (no emo)	Sexual (no eco)
Panel A: Overall effect (homogeneous)						
All women	-0.003	-0.017***	-0.049***	-0.043***	0.007*	0.003**
	(0.007)	(0.003)	(0.007)	(0.007)	(0.004)	(0.001)
Panel B: Overall effect (heterogeneous)						
Low	0.071**	0.080***	0.044	0.011***	0.014***	0.014**
	(0.023)	(0.020)	(0.028)	(0.002)	(0.003)	(0.006)
Intermediate	0.008**	0.008***	0.010**	0.003	-0.001	0.000
	(0.003)	(0.002)	(0.004)	(0.002)	(0.001)	(0.002)
High	-0.000	0.001	-0.001	0.002	0.002	0.006***
	(0.005)	(0.004)	(0.005)	(0.001)	(0.002)	(0.001)
Panel C: Differential effect						
Intermediate vs. Low	-0.063**	-0.072***	-0.034	-0.008**	-0.015***	-0.014**
	(0.025)	(0.021)	(0.032)	(0.003)	(0.003)	(0.005)
High vs. Low	-0.071**	-0.079***	-0.045	-0.009***	-0.012***	-0.008
	(0.026)	(0.023)	(0.032)	(0.002)	(0.003)	(0.006)
High vs. Intermediate	-0.008*	-0.007*	-0.011**	-0.002	0.003	0.006*
	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Observations	55,593	55,593	55,593	55,593	55,593	55,593

Notes: Panels A and B report the OLS estimates associated with the variable $Treat \times Post$. Panel C reports the OLS estimates associated with the variable $Treat \times Post$ interacted with the man's educational level. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Emo' stands for 'emotional' and 'eco' for economic. 'Low' refers to less than primary education completed, 'Intermediate' to primary, secondary or vocational training completed, and 'High' to university education completed. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, woman's educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

Table B11: Effect of easier divorce on IPV – Heterogeneous effects by wife's education: Alternative definitions of physical and sexual IPV

	(1)	(2)	(3)	(4)	(5)	(6)
	Physical (no emo and eco)	Physical (no emo)	Physical (no eco)	Sexual (no emo and eco)	Sexual (no emo)	Sexual (no eco)
Panel A: Overall effect (homogeneous)						
All women	-0.003	-0.017***	-0.049***	-0.043***	0.007*	0.003**
	(0.007)	(0.003)	(0.007)	(0.007)	(0.004)	(0.001)
Panel B: Overall effect (heterogeneous)						
Low	0.066***	0.070***	0.065***	0.009***	0.019***	0.012**
	(0.005)	(0.004)	(0.008)	(0.002)	(0.004)	(0.005)
Intermediate	0.006*	0.007**	0.006*	0.002	-0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
High	0.004**	0.006***	0.003	0.003*	0.003	-0.001
	(0.002)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)
Panel C: Differential effect						
Intermediate vs. Low	-0.060***	-0.063***	-0.059***	-0.007*	-0.021***	-0.010**
	(0.006)	(0.005)	(0.011)	(0.004)	(0.006)	(0.004)
High vs. Low	-0.062***	-0.064***	-0.062***	-0.006**	-0.016***	-0.013**
	(0.006)	(0.005)	(0.011)	(0.003)	(0.005)	(0.005)
High vs. Intermediate	-0.001	-0.001	-0.003	0.000	0.004	-0.003
	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)
Observations	55,593	55,593	55,593	55,593	55,593	55,593

Notes: Panels A and B report the OLS estimates associated with the variable $Treat \times Post$. Panel C reports the OLS estimates associated with the variable $Treat \times Post$ interacted with the woman's educational level. Robust standard errors clustered at the state level in parentheses. Sampling weights are applied. 'Emo' stands for 'emotional' and 'eco' for economic. 'Low' refers to less than primary education completed, 'Intermediate' to primary, secondary or vocational training completed, and 'High' to university education completed. The sample includes women who were married at the time of the reform and continue to be married at the time of the survey. The dependent variable is an indicator of whether the woman has experienced IPV in the year before the survey. All specifications control for both partners' age, both partners' indigenous background, man's educational attainment, woman's experience of violence in her childhood, length of the relationship, number of young children, urban residence, SES index, and state and year fixed effects. ***significant at 1% level, **at 5%, *at 10%.

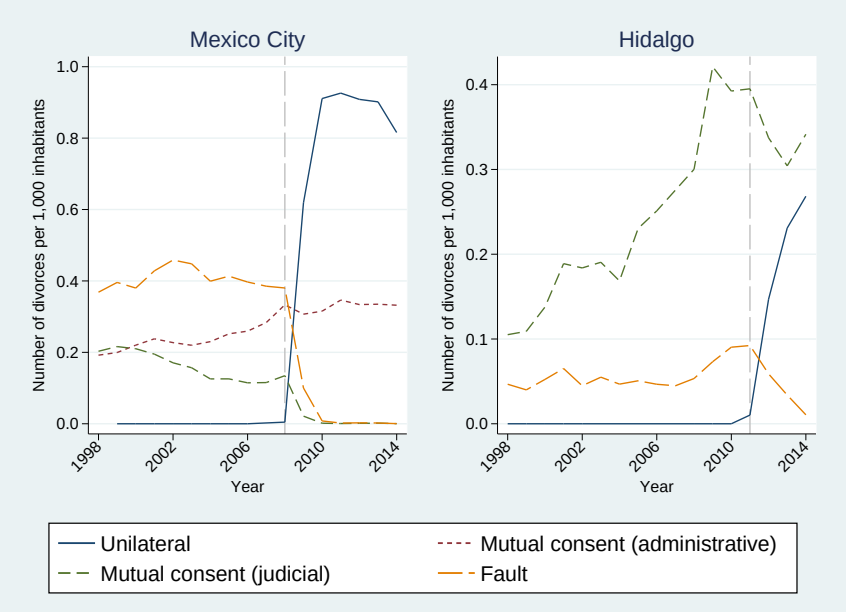
Table B12: Descriptive statistics: Decision-making power

	2003		2006		2011	
	T	C	T	C	T	C
Woman's decision making-power: Overall	0.234	0.237	0.295	0.279	0.339	0.321
Woman's decision making-power: Personal	0.260	0.267	0.570	0.518	0.690	0.613
Woman's decision making-power: Household	0.223	0.222	0.181	0.181	0.187	0.195
Man's decision making-power: Overall	0.067	0.065	0.101	0.107	0.069	0.089
Man's decision making-power: Personal	0.075	0.073	0.101	0.119	0.064	0.085
Man's decision making-power: Household	0.064	0.062	0.101	0.102	0.072	0.092
Both partners' decision making-power: Overall	0.555	0.563	0.604	0.612	0.590	0.589
Both partners' decision making-power: Personal	0.500	0.504	0.328	0.362	0.245	0.301
Both partners' decision making-power: Household	0.577	0.588	0.717	0.714	0.740	0.711
Relative decision making-power: Overall	0.167	0.172	0.194	0.173	0.269	0.232
Relative decision making-power: Personal	0.186	0.194	0.468	0.399	0.627	0.529
Relative decision making-power: Household	0.159	0.161	0.080	0.080	0.115	0.103
Observations	1,597	14,293	3,262	16,104	3,483	16,439

Notes: 'T' stands for treatment and 'C' for control. Woman's (man's) decision-making power refers to the proportion of decisions made by the woman (man) alone. Both partners' decision-making power refers to the proportion of decisions made by both partners jointly. Relative decision-making power is the proportion of decisions made by the woman alone minus the proportion of decisions made by the man alone.

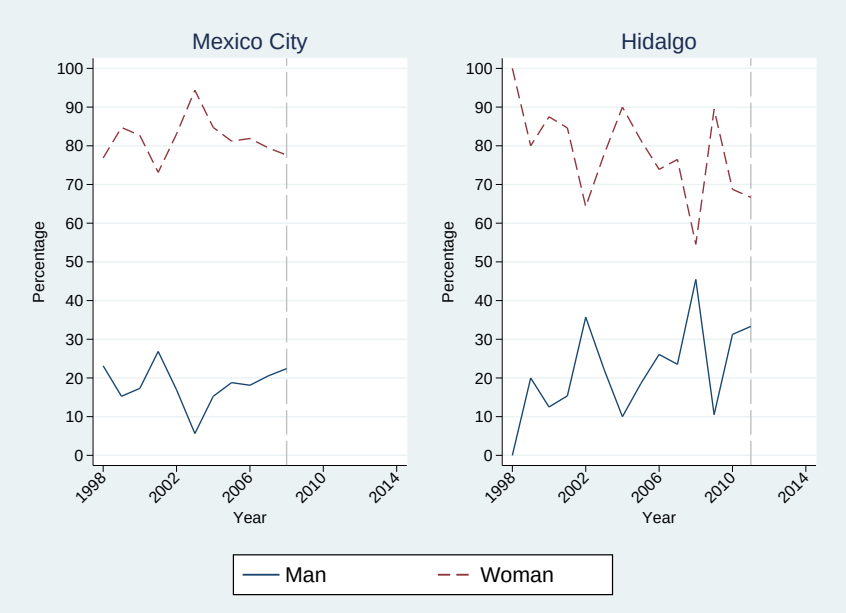
Supplementary figures

Figure B1: Divorce rate by type of divorce



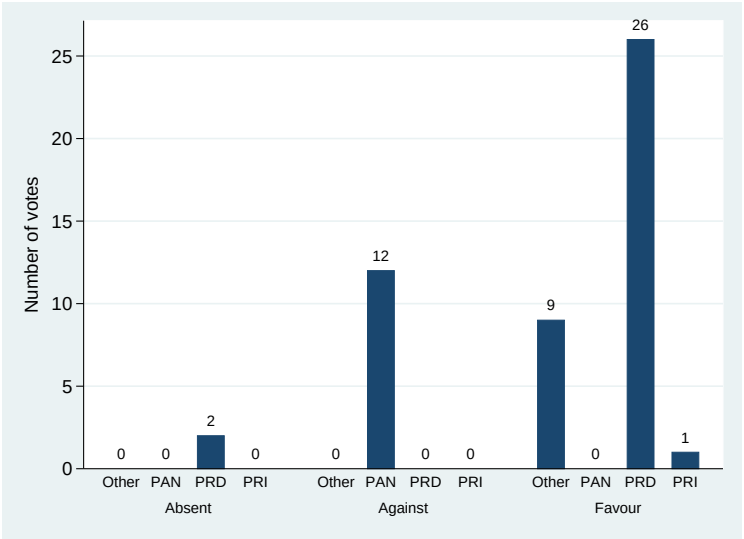
Notes: The vertical axes refer to the annual number of divorces per 1,000 inhabitants. The vertical lines refer to the year unilateral divorce was introduced (2008 in Mexico City and 2011 in Hidalgo). *Source:* Divorce statistics, INEGI

Figure B2: Percentage of divorces by who initiates divorce grounded on domestic violence



Notes: The vertical axes refer to the percentage of divorces initiated by women and men grounded on the explicit cause of domestic violence or the cause of 'brutality, threats and serious injuries'. The vertical lines refer to the year unilateral divorce was introduced (2008 in Mexico City and 2011 in Hidalgo). *Source:* Divorce statistics, INEGI.

Figure B3: Distribution of votes in the Legislative Assembly



Notes: The vertical axis refers to the number of votes. *Source: Diario de los debates de la Asamblea Legislativa del Distrito Federal*, 27 August 2008.

C Appendix: Chapter 4

Supplementary tables

Table C1: Years of elections

State	Years	State	Years
Aguascalientes	2001, 2004, 2007	Morelos	2003, 2006, 2009
Baja California	2001, 2004, 2007	Nayarit	2002, 2005, 2008
Baja California	2002, 2005, 2008	Nuevo Leon	2003, 2006, 2009
Campeche	2003, 2006, 2009	Oaxaca	2001, 2004, 2007
Coahuila	2002, 2005, 2009	Puebla	2001, 2004, 2007
Colima	2003, 2006, 2009	Queretaro	2003, 2006, 2009
Chiapas	2001, 2004, 2007	Quintana Roo	2002, 2005, 2008
Chihuahua	2001, 2004, 2007	San Luis Potosi	2003, 2006, 2009
Mexico City	2003, 2006, 2009	Sinaloa	2001, 2004, 2007
Durango	2001, 2004, 2007	Sonora	2003, 2006, 2009
Guanajuato	2003, 2006, 2009	Tabasco	2003, 2006, 2009
Guerrero	2002, 2005, 2008	Tamaulipas	2001, 2004, 2007
Hidalgo	2002, 2005, 2008	Tlaxcala	2001, 2004, 2007
Jalisco	2003, 2006, 2009	Veracruz	2000, 2004, 2007
Estado de Mexico	2003, 2006, 2009	Yucatan	2004, 2007, 2010
Michoacan	2001, 2004, 2007	Zacatecas	2001, 2004, 2007

Table C2: Effect of lame duck period on executions – Poisson and Negative binomial models

	(1)	(2)	(3)	(4)
	Poisson		Negative binomial	
Election	-0.182	-0.047	0.053	0.087
	(0.164)	(0.215)	(0.090)	(0.113)
Lame duck	0.058	0.004	0.013	-0.117
	(0.212)	(0.204)	(0.070)	(0.085)
Inauguration	-0.086	0.013	-0.043	-0.090
	(0.222)	(0.290)	(0.089)	(0.100)
Month FE	No	Yes	No	Yes
Observations	9,450	9,450	9,450	9,450
Municipalities	632	632	632	632

Notes: This table estimates equation 4.1. The dependent variable is the homicide rate (number of homicides per 100,000 inhabitants). 'Election', 'Lame duck' and 'Inauguration' are indicators of whether the month is the month of the election, is part of the lame duck period, and is the month of the inauguration, respectively. 'Lame duck' is defined as the period between the month after the election and the month before the inauguration of the new term. All specifications control for a full set of municipality and year fixed effects. Robust standard errors clustered at the municipality level in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Table C3: Effect of winning party on executions

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
	Close to US	Far from US	Close to US	Far from US	Close to US	Far from US
Panel A: PAN wins						
Lame duck (Linear)	-0.048	-0.021	-0.165	0.034	-0.214	0.045
	(0.122)	(0.069)	(0.183)	(0.089)	(0.230)	(0.112)
Lame duck (Quadratic)	-0.070	-0.031	-0.111	0.031	-0.139	0.041
	(0.125)	(0.073)	(0.199)	(0.118)	(0.252)	(0.151)
Observations	791	994	791	994	791	994
Panel B: PRI wins						
Lame duck (Linear)	0.100	0.015	0.229	0.010	0.289	0.011
	(0.085)	(0.051)	(0.159)	(0.067)	(0.198)	(0.085)
Lame duck (Quadratic)	0.112	0.011	0.232	0.015	0.295	0.017
	(0.094)	(0.065)	(0.191)	(0.071)	(0.237)	(0.090)
Observations	839	1,014	839	1,014	839	1,014

Notes: This table estimates equation 4.3. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Observations' refers to the total number of observations in the sample. It does not correspond with the number of observations used for the RD analysis, which depends on the optimal bandwidth in each case. Robust standard errors in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Table C4: Effect of political party turnover on executions

	(1)	(2)	(3)	(4)	(5)	(6)
	Homicide≥1		Ln(Homicide rate)		IHS(Homicide rate)	
	Close to US	Far from US	Close to US	Far from US	Close to US	Far from US
Lame duck (Linear)	-0.122	0.102**	-0.202	0.047	-0.250	0.058
	(0.089)	(0.047)	(0.163)	(0.033)	(0.203)	(0.040)
Lame duck (Quadratic)	-0.110	0.111**	-0.179	0.058	-0.227	0.069
	(0.092)	(0.053)	(0.197)	(0.040)	(0.245)	(0.050)
Observations	808	991	808	991	808	991

Notes: This table estimates equation 4.3. The dependent variable in columns 1-2 is an indicator of whether there has been at least one homicide, in columns 3-4 the natural logarithm of the homicide rate (number of homicides per 100,000 inhabitants), and in columns 5-6 the inverse hyperbolic sine transformation of the homicide rate. 'Lame duck' is an indicator of whether the month is part of the lame duck period, which is defined as the period between the month after the election and the month before the inauguration of the new term. 'Observations' refers to the total number of observations in the sample. It does not correspond with the number of observations used for the RD analysis, which depends on the optimal bandwidth in each case. Robust standard errors in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Validity of the regression discontinuity design

Winning party

The key identification assumption of the regression discontinuity design outlined in equation 4.3 is the continuity in potential outcomes at the cutoff, i.e. any discontinuity in potential homicides at the cutoff is the consequence of winning the election. If this assumption holds, any difference in executions can be interpreted as the causal effect of winning the election. I next conduct two tests in order to provide support for the validity of this assumption.

The first one refers to whether the density of the running variable is continuous at the threshold. If it is continuous, this shows support against manipulation of the running variable. In order to examine this, I plot the density of the margin of victory (top graph of figure C1), which seems smooth at the cutoff. To test this more formally, I conduct the test proposed by McCrary (2008). The null hypothesis is that the density of the margin of victory is continuous at the zero threshold. The discontinuity estimate (log difference in height) is -0.019 with a standard error of 0.12 for the PAN, whereas it is 0.03 and 0.097, respectively, for the PRI (see the associated graph in the bottom of figure C1). In short, this shows no evidence for manipulation of the margin of victory at the zero threshold[8].

The second way in which I examine the validity of the RD design is by looking at whether there is continuity in baseline characteristics at the cutoff. This can be interpreted as a placebo test since variables in the pre-treatment period should not be affected by electoral outcomes in subsequent periods. Figure C2 plots several political variables against the PAN and PRI margins of victory, figures C3 and C4 socio-economic characteristics, and figure C5 demographic variables, the distance to the US and DTOs presence in the municipality. For information on the construction and data sources of these variables see the *Notes* in each table. Finally, figure C6 plots executions in the three months

[8]An alternative manipulation test has been recently proposed by Cattaneo et al. (2017), which is implemented in Stata using the command *rddensity*. In my specific case, the value of this test is equal to 0.68 (p-value of 0.50) for the PAN and 0.70 (p-value of 0.48) for the PRI, which essentially yields the same conclusions.

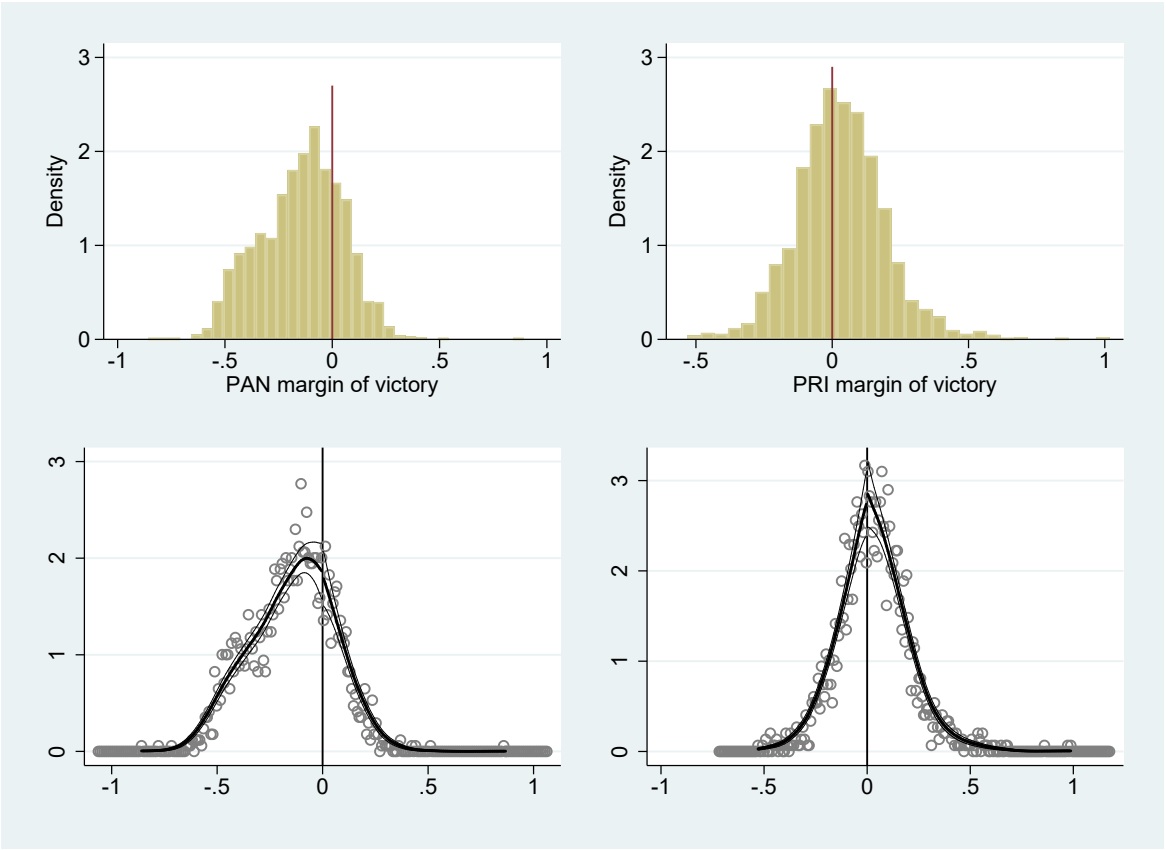
before the election. In short, it seems that the baseline variables vary smoothly around the cutoff.

In order to more formally test for whether there is a discontinuity at the zero threshold I estimate equation 4.3 using each baseline variable as outcome. Table C5 presents the corresponding RD results using a local linear method. Columns 1-3 focus on the PAN, while columns 4-6 on the PRI. Columns 1 and 3 report the RD estimates, columns 2 and 4 the corresponding standard errors, and column 3 and 6 the robust bias corrected p-value[9], As can be seen, all RD estimates, with the exception of one[10], are insignificant. Even so, in general, the results in table C5 show support for continuity in baseline characteristics and outcome at the cutoff, which provides validity for the RD design.

[9]For more details see Cattaneo et al. (2018a).

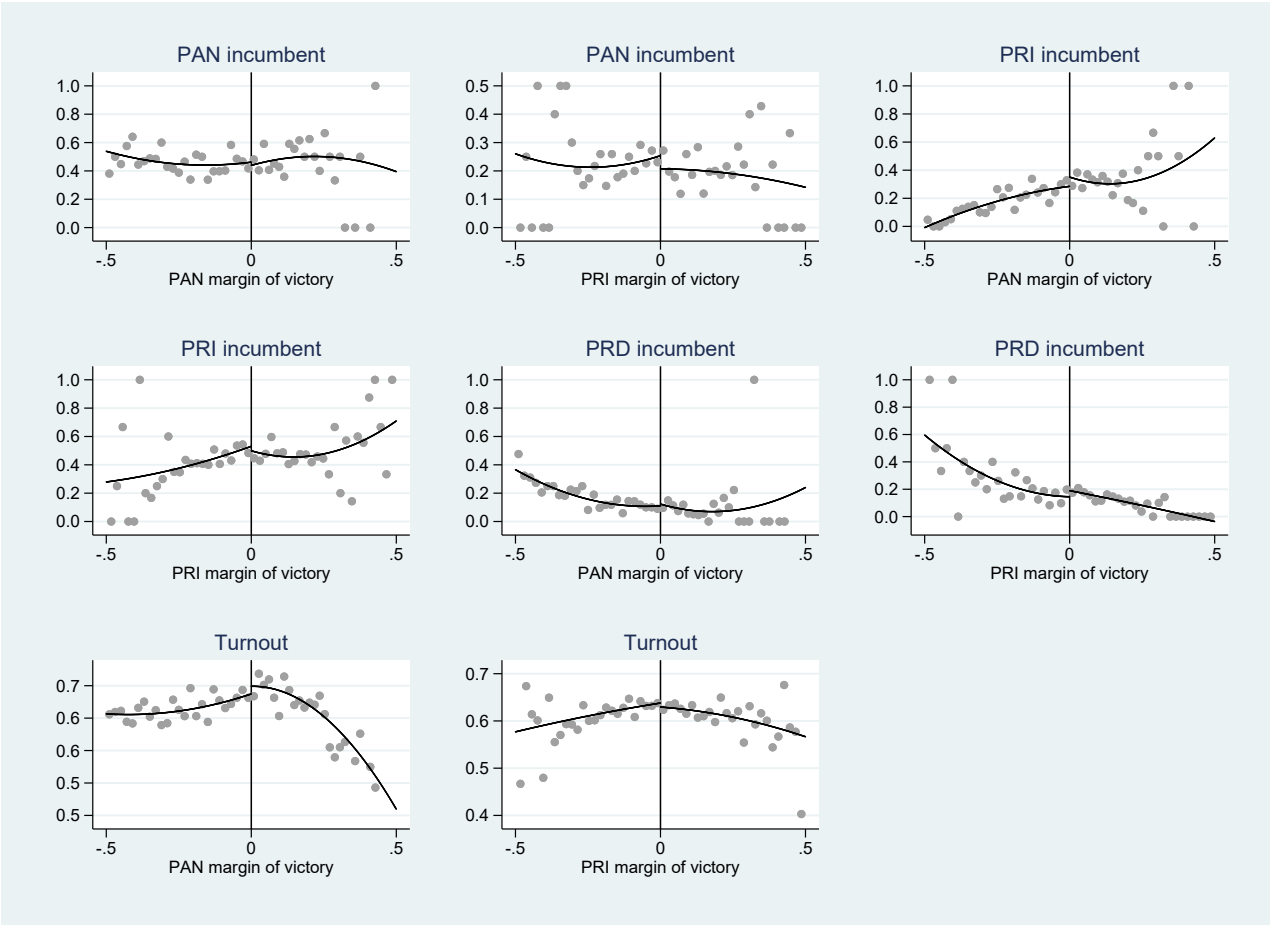
[10]This is the percentage of households without drainage, which is significant at the 5% level when it is regressed against the PRI margin of victory.

Figure C1: Validity of the RD design: Distribution of the margin of victory



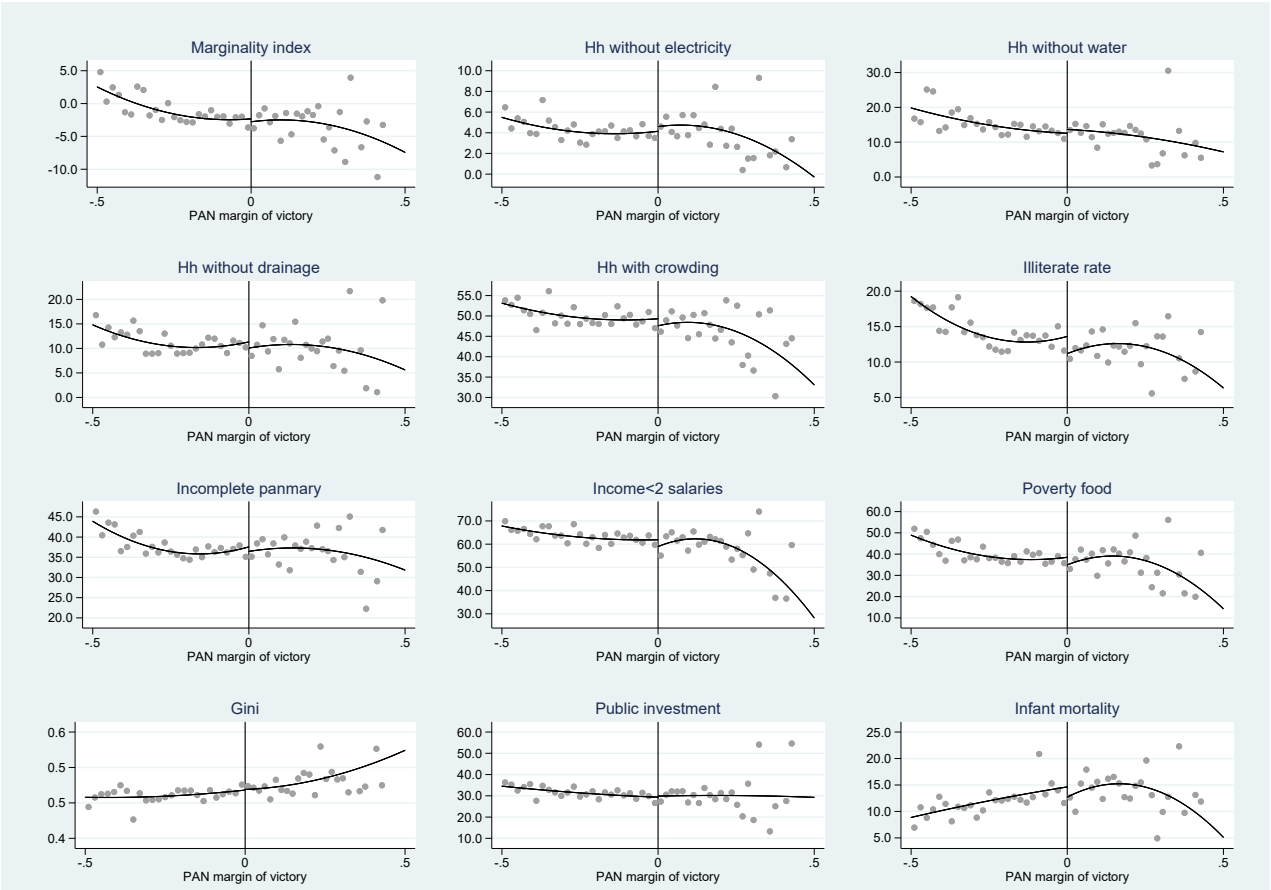
Notes: These graphs show the density of the margin of victory. The plots on the bottom panel are the graphs associated with the McCrary (2008) test. The discontinuity estimate is -0.019 and the standard error 0.12 for the PAN, whereas it is 0.03 and 0.097, respectively, for the PRI.

Figure C2: Validity of the RD design: Political characteristics



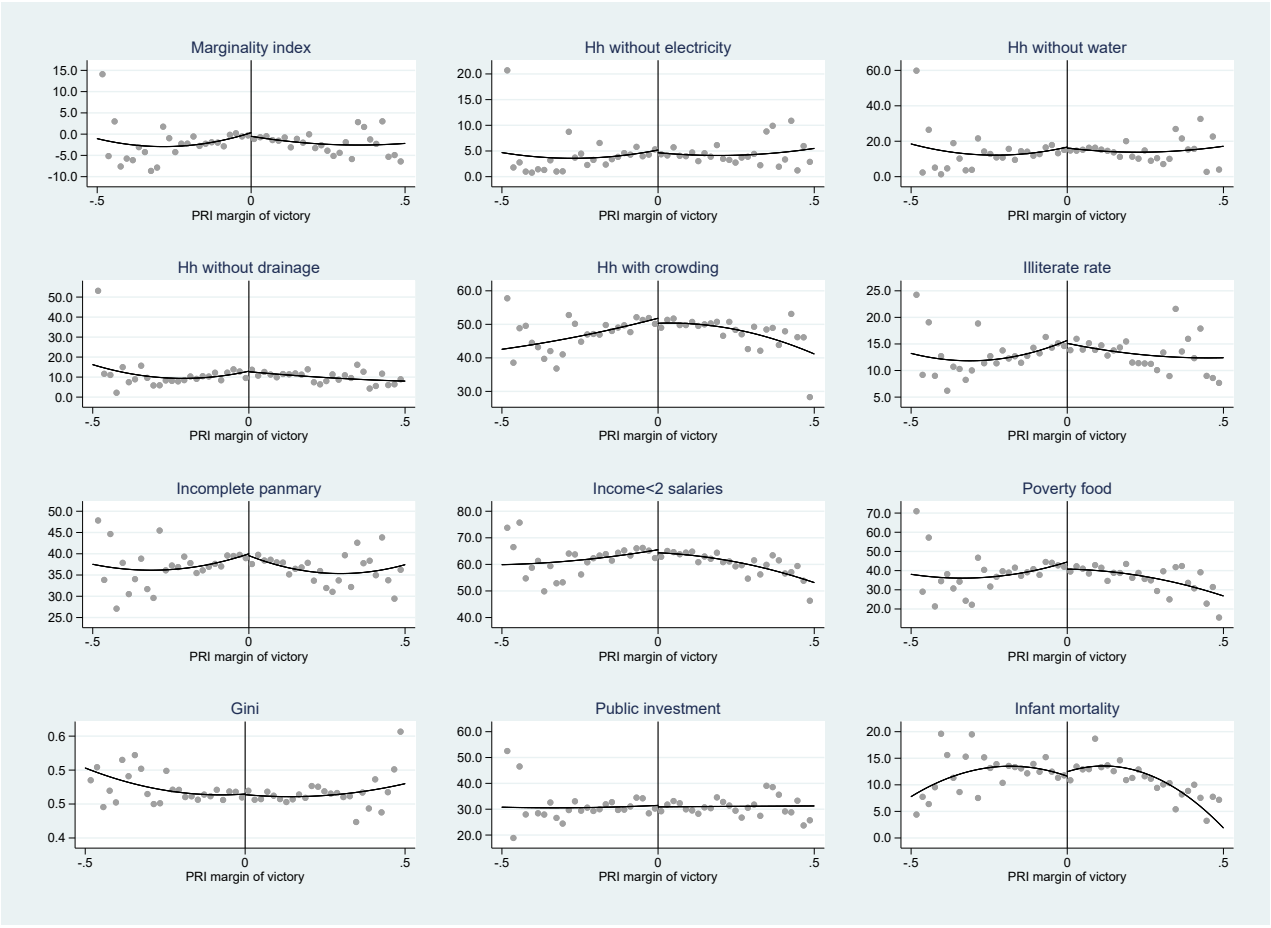
Notes: Each graph plots a different variable related with political characteristics at the baseline. The variables are calculated using data on elections occurring between 2001 and 2006 (2007 for Yucatan). See columns 1-2 of table C1 for the specific years in each state. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. 'Incumbent PRI' is an indicator of whether the PRI is the incumbent party. 'Incumbent PAN' and 'Incumbent PRD' are defined in an analogous way.

Figure C3: Validity of the RD design: Socio-economic characteristics (PAN)



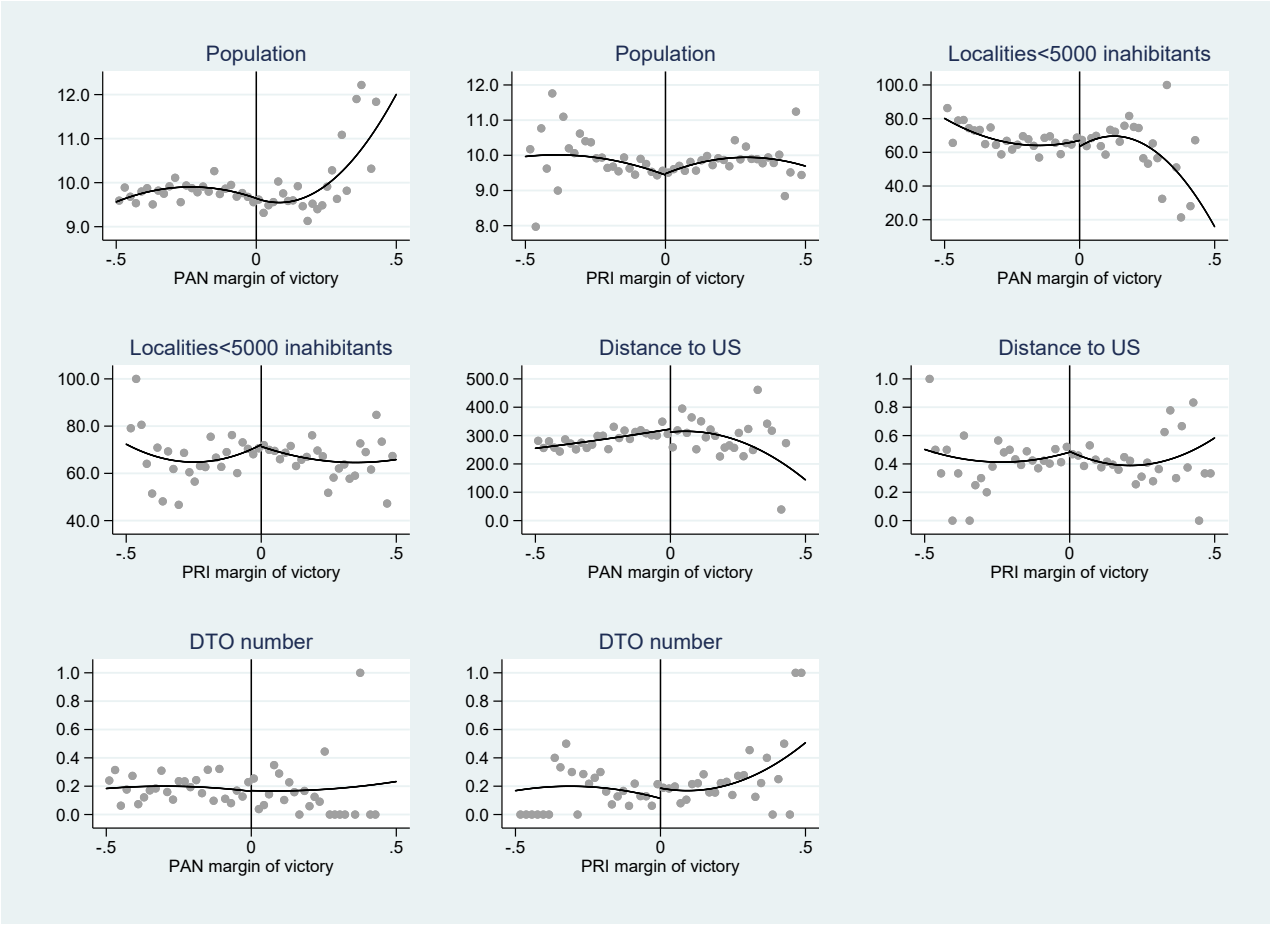
Notes: Each graph plots a different variable related with socio-economic characteristics at the baseline. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. The marginality index is computed as explained in Anzaldo and Prado (2006). 'Hh without electricity' is the percentage of dwellings in the municipality without electricity. 'Hh without water', and 'Hh without drainage' are defined in a similar way. 'Hh with crowding' is the percentage of households in which more than two people sleep in a bedroom. 'Illiterate rate' is the percentage of individuals 15 or older who cannot read or write. 'Incomplete primary' is the percentage of individuals 15 or older who have not completed primary education. 'Income<2 salaries' is the percentage of individuals who receive income up to 2 minimum salaries. These 7 variables are obtained from CONAPO (*Consejo Nacional de Población)* [National Council of Population]. They are constructed based on the Population and Dwelling Count of 2005 and the ENOE (*Encuesta Nacional de Ocupación y Empleo)* [National Survey of Occupation and Employment]. The Gini index is obtained from CONEVAL (*Consejo Nacional de Evaluacion de la Politica de Desarrollo Social)* [National Council for the Evaluation of Social Development Policy] and refers to the year 2000. It is computed using the 2000 ENIGH (*Encuesta Nacional de Ingresos y Gastos de los Hogares)* [National Surveyof Household Income and Expenditure]. 'Poverty' is the percentage of individuals living below the food poverty line, as calculated by CONEVAL. It is computed using the 2000 Population and Dwelling Census and the 2000 ENIGH. 'Public investment' is defined as the percentage of public investment over the total investment in the municipality. 'Infant mortality' is the number of deaths of children less than one year divided by the number of births per 1000. These two variables are obtained using the 2005 Population and Dwelling Count.

Figure C4: Validity of the RD design: Socio-economic characteristics (PRI)



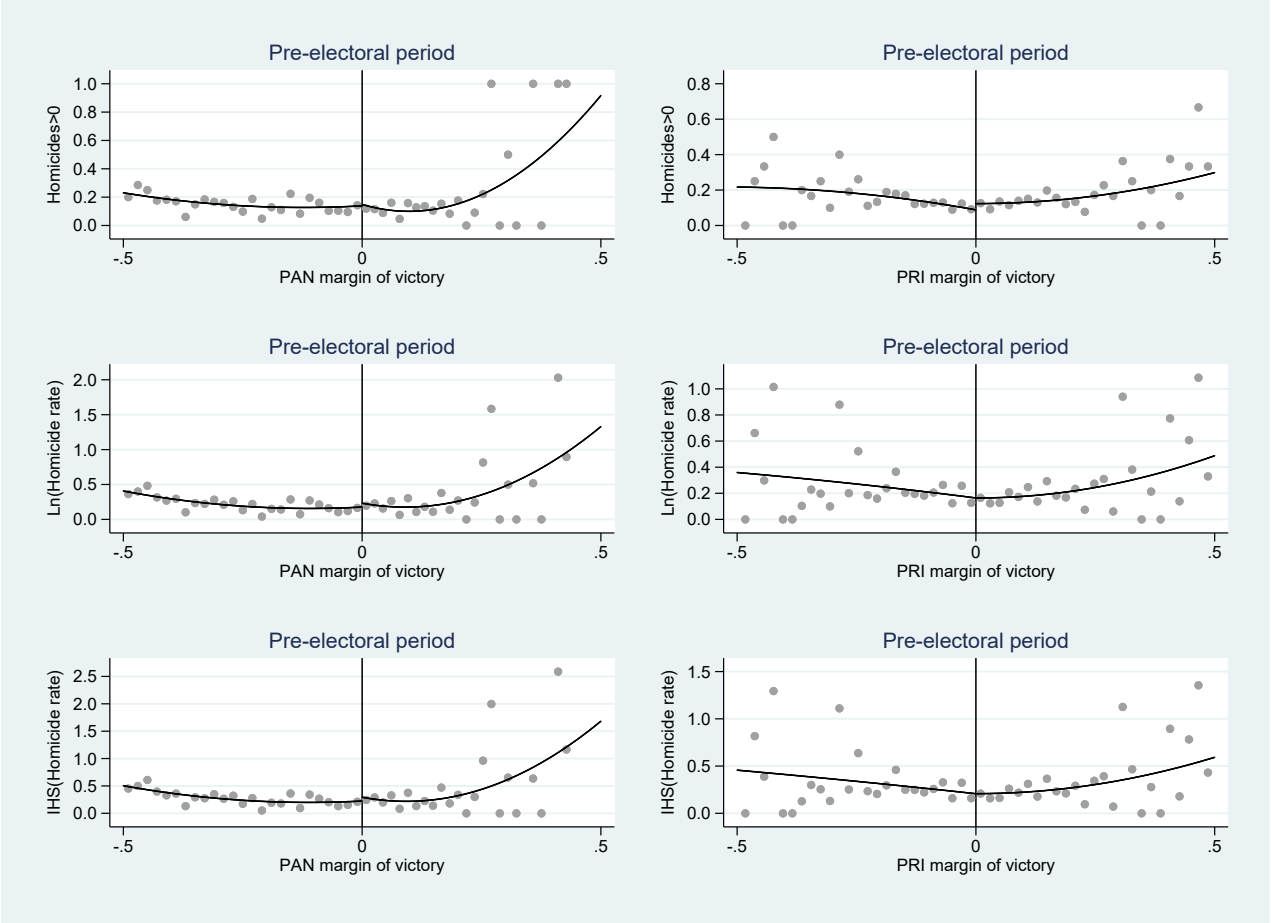
Notes: See *Notes* in figure C3.

Figure C5: Validity of the RD design: Demographic characteristics, Distance and DTOs



Notes: Each graph plots a different variable related with demographic characteristics at the baseline, distance to the US and presence of DTOs at the baseline. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. 'Population' is the population in natural logarithms. 'Localities<5000 inhabitants' refers to the percentage of localities with less than 5000 inhabitants. Data come from CONAPO. 'Distance to US' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'DTO number' is the number of DTOs operating in the municipality in the year 2005.

Figure C6: Validity of the RD design: Homicides in pre-electoral period



Notes: 'Pre-electoral period' refers to the three months before the elections included in my main analysis (i.e. those occurring between 2007 and 2010). The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately in each side of the cutoff.

Table C5: Validity of RD design – Baseline variables

	(1)	(2)	(3)	(4)	(5)	(6)
	PAN			PRI		
	Estimate	SE	P-value	Estimate	SE	P-value
Panel A: Political characteristics						
Incumbent PRI	-0.106	(0.103)	0.304	0.071	(0.073)	0.332
Incumbent PAN	0.115	(0.110)	0.292	-0.114	(0.080)	0.152
Incumbent PRD	0.031	(0.061)	0.614	-0.017	(0.066)	0.798
Turnout	0.014	(0.020)	0.505	-0.009	(0.016)	0.586
Panel B: Socio-economic characteristics						
Marginality index	0.568	(1.566)	0.717	-1.094	(1.315)	0.405
Hh w/o electricity	1.734	(1.256)	0.167	-0.499	(0.928)	0.591
Hh w/o water	3.968	(3.040)	0.192	-0.937	(2.546)	0.713
Hh w/o drainage	-1.480	(2.316)	0.523	4.947**	(2.264)	0.029
Hh with crowding	-0.990	(2.610)	0.704	-0.610	(2.163)	0.778
Illiterate rate	-1.581	(1.679)	0.346	-0.606	(1.551)	0.696
Incomplete primary	1.409	(2.123)	0.507	-1.889	(1.844)	0.306
Income<2 salaries	-3.985	(3.781)	0.292	0.566	(2.687)	0.833
Poverty	-1.051	(4.138)	0.799	-2.635	(3.059)	0.389
Gini	-0.000	(0.014)	0.994	0.004	(0.010)	0.716
Public investment	-0.634	(2.970)	0.831	1.229	(2.552)	0.630
Infant mortality	-0.332	(2.244)	0.883	-0.048	(1.630)	0.977
Panel C: Demographic characteristics						
Ln(population)	-0.069	(0.291)	0.811	0.054	(0.214)	0.800
Population<5000	-1.750	(7.322)	0.811	1.244	(5.416)	0.818
Panel D: Location + DTOs						
Distance	0.137	(0.103)	0.181	-0.092	(0.083)	0.267
DTOs	-0.069	(0.112)	0.541	0.045	(0.079)	0.565
Panel E: Homicides						
Homicides>0	-0.005	(0.068)	0.936	0.029	(0.046)	0.523
Ln(Homicides)	0.065	(0.116)	0.575	-0.009	(0.076)	0.903
IHS(Homicides)	0.076	(0.145)	0.602	0.000	(0.097)	0.997

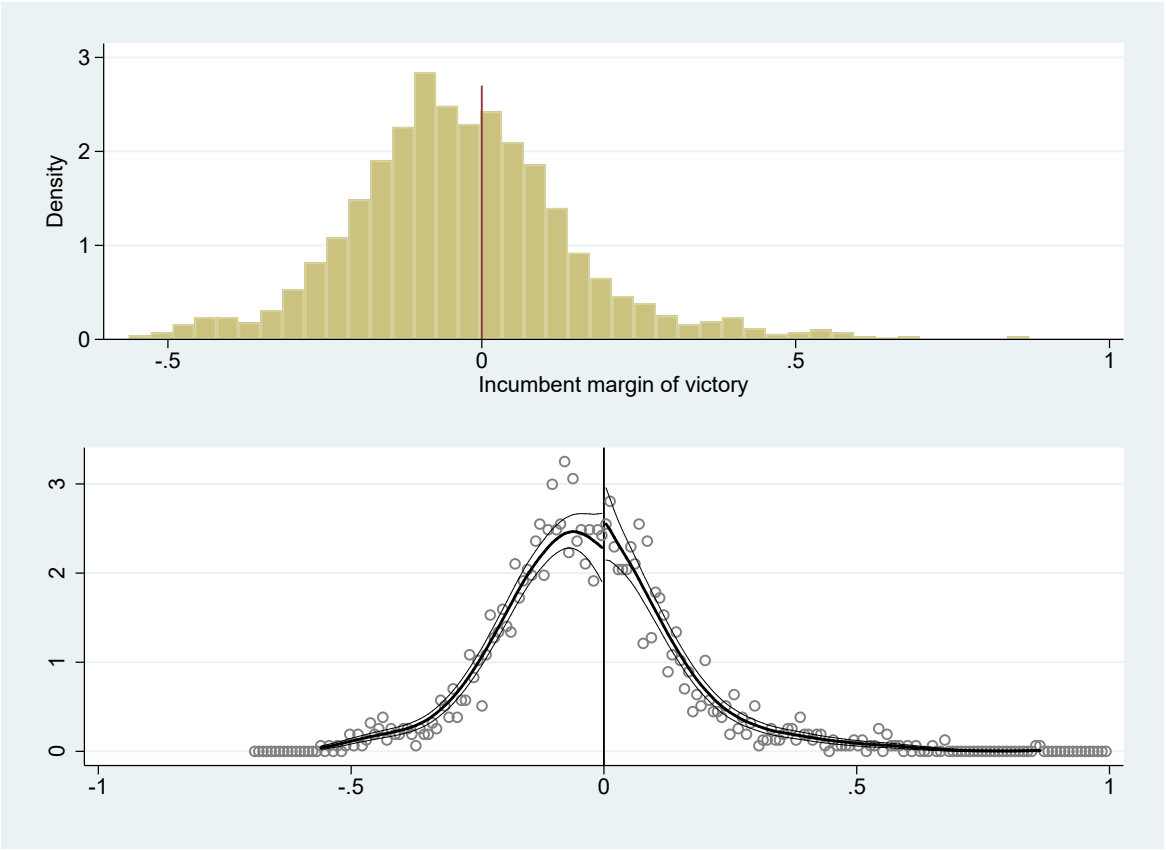
Notes: Columns 1 and 3 report the RD estimates associated with equation 4.3 when a first-order polynomial is used, columns 2 and 4 the standard errors, and columns 3 and 6 the robust bias corrected p-values. 'SE' stands for standard errors, 'Obs.' for observations, 'Hh' for household, and 'w/o' for without. The total number of observations in the sample is 1,794 for PAN (1,862 for PRI) in panel A; and 1,907 for PAN (1,975 for PRI) in panels B, C, D and E. The effective number of observations used to compute the estimates varies depending on the optimal bandwidth. Robust standard errors in parentheses. ***significant at 1% level, **at 5%, *at 10%.

Incumbent political party

As before, I first plot the density of the margin of victory and conduct the test proposed by McCrary (2008) (see figure C7). The discontinuity estimate is 0.13 with a standard error of 0.13. In short, this shows no evidence for manipulation of the margin of victory at the zero threshold[11]. I next examine whether the baseline characteristics mentioned before vary smoothly around the cutoff. Figures C8, C9, C10, and C11 plot these variables against the incumbent margin of victory. Table C6 presents the corresponding RD results using a local linear method. Two coefficients are significant at the 10% level, namely the indicator of homicides and the turnout. However, once I estimate a second- or higher-order polynomial they become insignificant and small in magnitude. In short, the results provide support for the validity of the RD design.

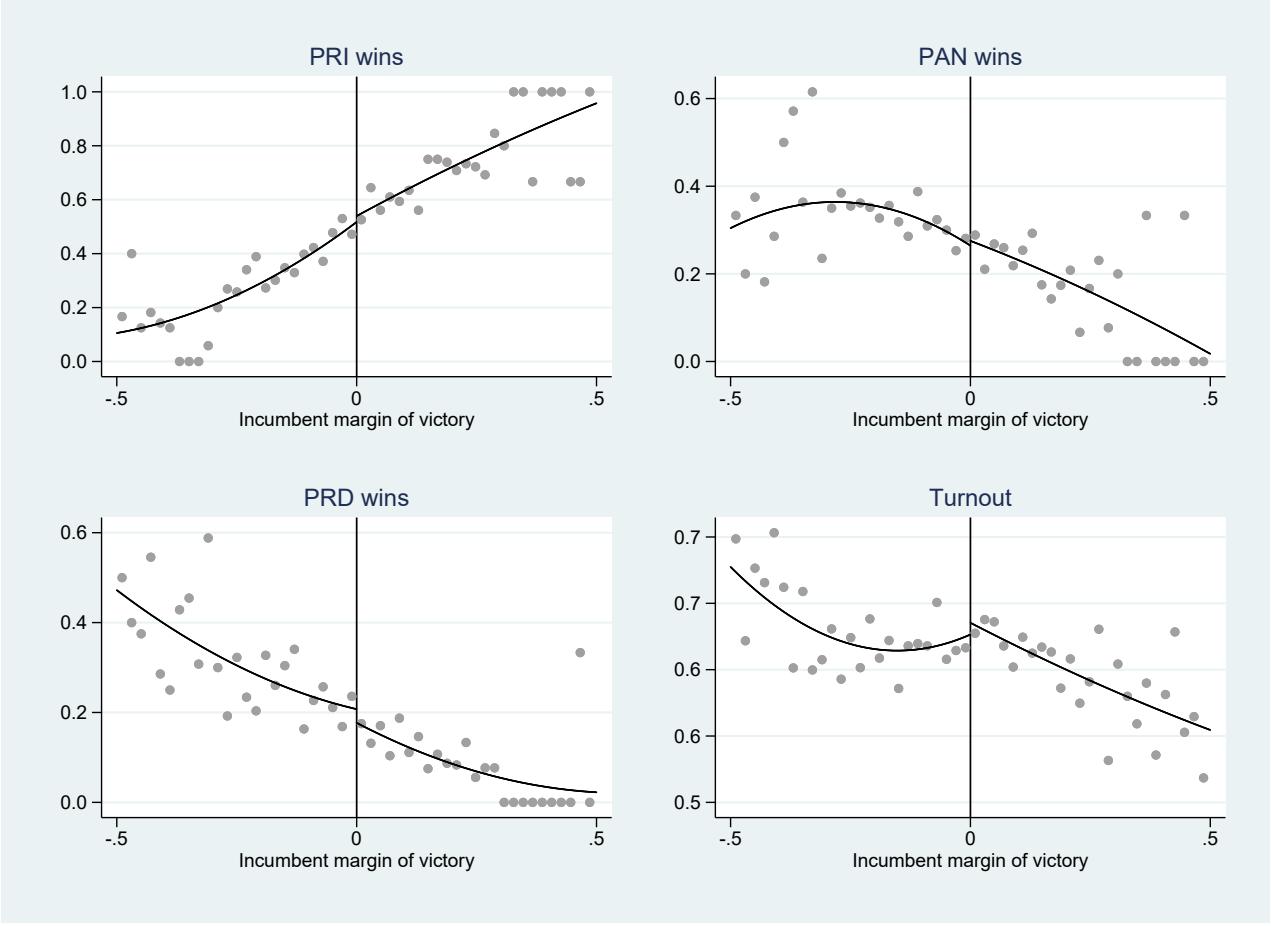
[11]The value of the test proposed by Cattaneo et al. (2017) is 0.12 and the p-value 0.90, which leads to the same conclusions.

Figure C7: Validity of the RD design: Distribution of the incumbent margin of victory



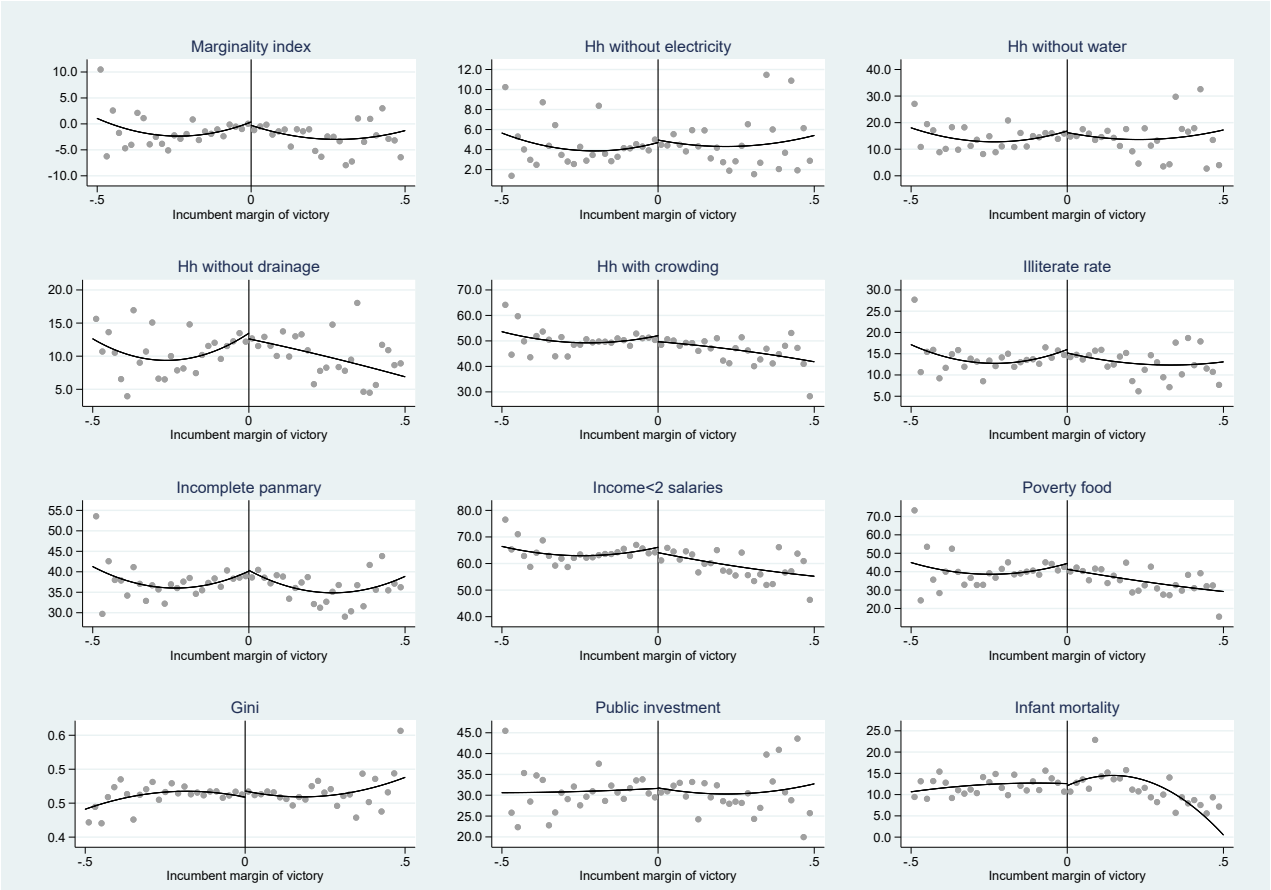
Notes: The two plots show the density of the incumbent margin of victory. The bottom one is the graph associated with the McCrary (2008) test. The discontinuity estimate is 0.13 and the standard error 0.13.

Figure C8: Validity of the RD design: Political characteristics



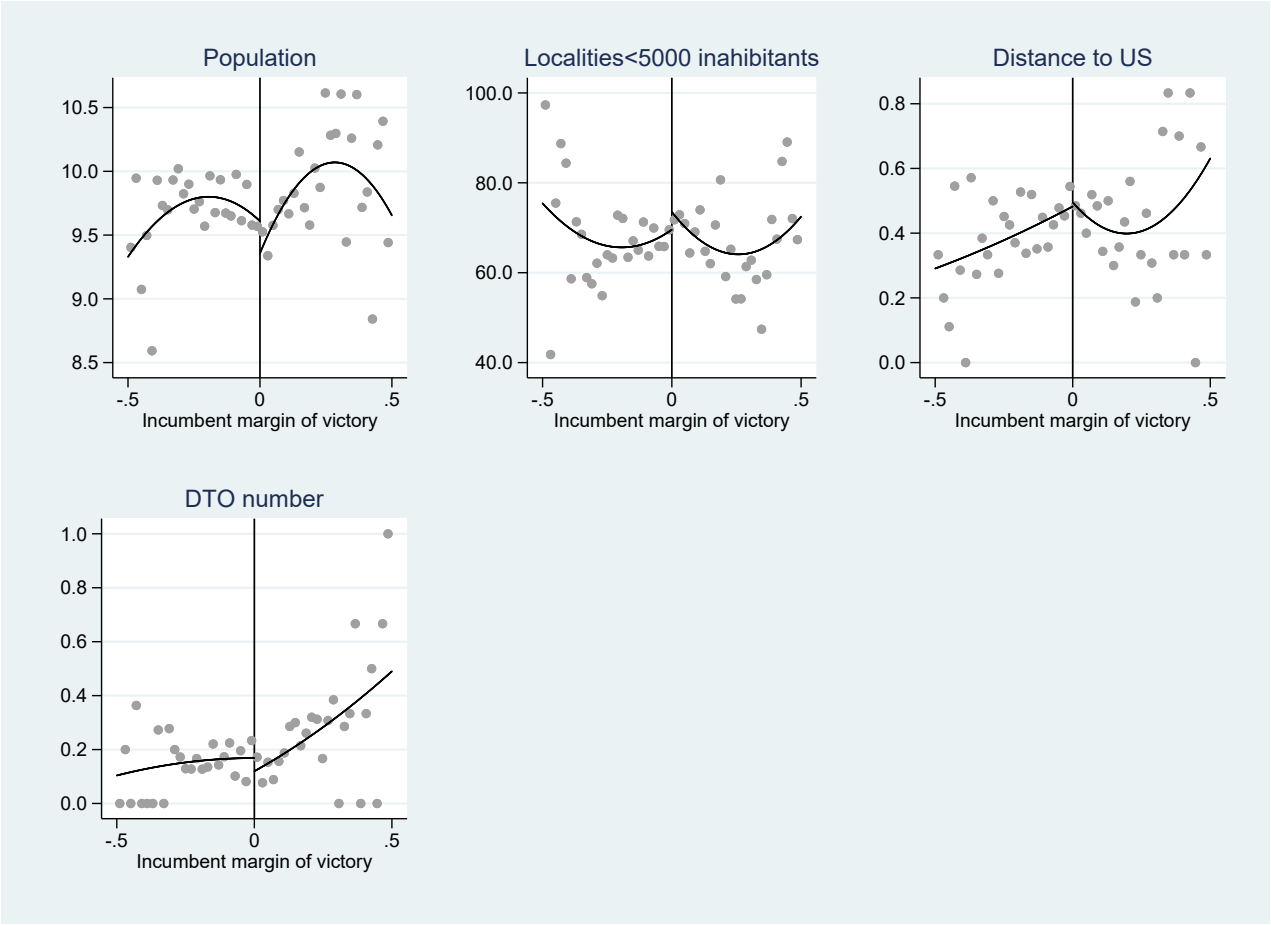
Notes: Each graph plots a different variable related with political characteristics at the baseline. The variables are calculated using data on elections occurring between 2001 and 2006 (2007 for Yucatan). See columns 1-2 of table C1 for the specific years in each state. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. 'Incumbent PRI' is an indicator of whether the PRI is the incumbent party. 'Incumbent PAN' and 'Incumbent PRD' are defined in an analogous way.

Figure C9: Validity of the RD design: Socio-economic characteristics



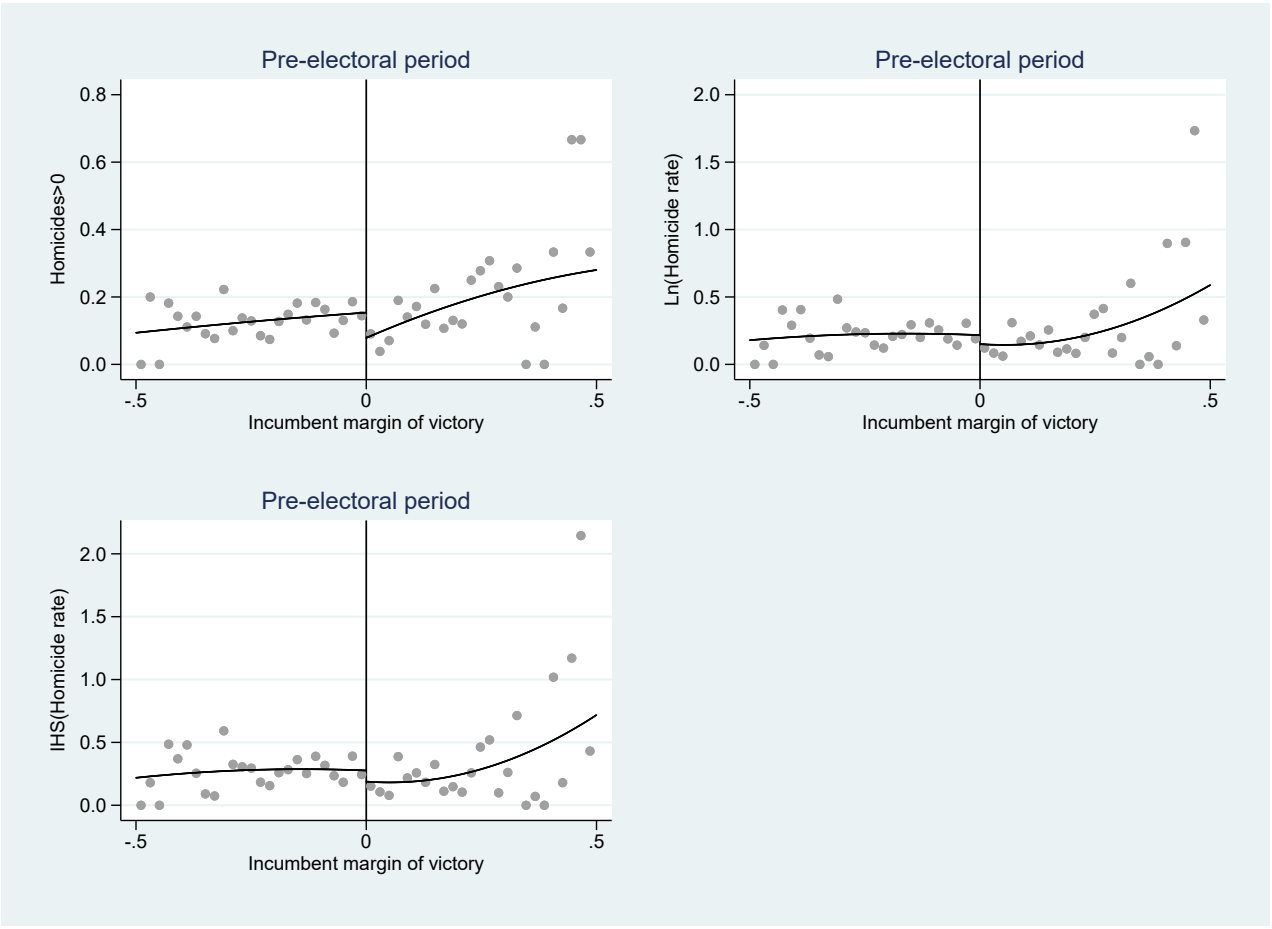
Notes: Each graph plots a different variable related with socio-economic characteristics at the baseline. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. The marginality index is computed as explained in Anzaldo and Prado (2006). 'Hh without electricity' is the percentage of dwellings in the municipality without electricity. 'Hh without water', and 'Hh without drainage' are defined in a similar way. 'Hh with crowding' is the percentage of households in which more than two people sleep in a bedroom. 'Illiterate rate' is the percentage of individuals 15 or older who cannot read and write. 'Incomplete primary' is the percentage of individuals 15 or older who have not completed primary education. 'Income<2 salaries' is the percentage of individuals who receive income up to 2 minimum salaries. These 7 variables are obtained from CONAPO[12]. They are constructed based on the Population and Dwelling Count of 2005 and the ENOE[13]. The Gini index is obtained from CONEVAL[14] and refers to the year 2000. It is computed using the 2000 ENIGH[15]. 'Poverty' is the percentage of individuals living below the food poverty line, as calculated by CONEVAL. It is computed using the 2000 Population and Dwelling Census and the 2000 ENIGH. 'Public investment' is defined as the percentage of public investment over the total investment in the municipality. 'Infant mortality' is the number of deaths of children less than one year divided by the number of births per 1000. These two variables are obtained using the 2005 Population and Dwelling Count.

Figure C10: Validity of the RD design: Demographic characteristics, Distance and DTOs



Notes: Each graph plots a different variable related with demographic characteristics at the baseline, distance to the US and presence of DTOs at the baseline. The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately on each side of the cutoff. 'Population' is the population in natural logarithms. 'Localities<5000 inhabitants' refers to the percentage of localities with less than 5000 inhabitants. Data come from CONAPO. 'Distance to US' is an indicator of whether the municipality is below the median distance to the closest point of entry in the US. 'DTO number' is the number of DTOs operating in the municipality in the year 2005.

Figure C11: Validity of the RD design: Homicides in pre-electoral period



Notes: 'Pre-electoral period' refers to the three months before the elections included in my main analysis (i.e. those occurring between 2007 and 2010). The points represent the average value of the outcome in bins of 2 percentage points. The solid line is a second-order global polynomial fitted separately in each side of the cutoff.

Table C6: Validity of RD design – Baseline variables

	(1)	(2)	(3)
	Estimate	SE	P-value
Panel A: Political characteristics			
Win PRI	-0.014	(0.071)	0.849
Win PAN	-0.048	(0.074)	0.515
Win PRD	0.056	(0.063)	0.375
Turnout	-0.031*	(0.018)	0.089
Panel B: Socio-economic characteristics			
Marginality index	0.690	(1.223)	0.573
Hh w/o electricity	0.373	(0.912)	0.682
Hh w/o water	1.325	(2.479)	0.593
Hh w/o drainage	0.746	(1.964)	0.704
Hh with crowding	1.563	(2.094)	0.455
Illiterate rate	1.325	(1.659)	0.425
Incomplete primary	-0.563	(2.058)	0.785
Income<2 salaries	1.844	(2.873)	0.521
Poverty	1.948	(3.172)	0.539
Gini	0.003	(0.011)	0.793
Public investment	-1.061	(2.473)	0.668
Infant mortality	-1.492	(1.788)	0.404
Panel C: Demographic characteristics			
Ln(population)	0.192	(0.178)	0.279
Population<5000	-4.171	(4.811)	0.386
Panel D: Location + DTOs			
Distance	0.077	(0.081)	0.342
DTOs	0.043	(0.093)	0.647
Panel E: Homicides			
Homicides>0	0.084*	(0.046)	0.065
Ln(Homicides)	0.114	(0.088)	0.195
IHS(Homicides)	0.150	(0.111)	0.175

Notes: Columns 1 and 3 report the RD estimates associated with equation 4.3 when a first-order polynomial is used, columns 2 and 4 the standard errors, and columns 3 and 6 the robust bias corrected p-values. 'SE' stands for standard errors, 'Obs.' for observations, 'Hh' for household, and 'w/o' for without. The total number of observations in the sample is 1,879 in panel A and 1,919 in panels B, C, D and E. The effective number of observations used to compute the estimates varies depending on the optimal bandwidth. Robust standard errors in parentheses. ***significant at 1% level, **at 5%, *at 10%.

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