Non-agricultural employment, intimate partner violence and gender roles in Nicaragua, 1998-2012

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Abstract

This paper compares impacts of new employment opportunities in manufacturing on several types of outcomes reflecting women's wellbeing: Experiences of intimate partner violence (IPV), views of the acceptability of IPV and of gender roles, and anthropometric measures. Timing of export processing zone placements and characteristics of recruited employees are exploited for inference, as in Grogan (2025). Women become less accepting of violence with this new employment. Reported views of household gender roles become more conservative, although their access to food increases. The incidence of IPV increases. Newly-employed women may acquiesce to traditional gender norms to mitigate partners' re-assertion of control.

JEL codes: O12, J12, J26.

Key words: gender roles, intimate partner violence (IPV), manufacturing employment, export processing zones, bargaining power, anthropometry

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1 Introduction

This paper aims to understand the changes in household gender norms which occur as a result of a woman obtaining low-wage, salaried non-agricultural employment in Nicaragua. After the collapse of communism in 1990, successive governments sought international capital to promote manufacturing sectors. International firms locating in Nicaragua obtained favourable tax and regulatory conditions (see, Mendez (2005), Jansen, Morley, Kessler, Piñeiro, Sánchez, and Torero (2008) and MacDonald (2014)). Export-processing zones (EPZs) were gradually introduced across several municipalities in Nicaragua. These firms tended to employ women without secondary education. The resulting changes in labour demand created a natural experiment with which to examine impacts on relationships between partners in households in one of the poorest countries in Latin America.

There are several mechanisms through which an improvement in employment prospects of women might affect relations between partners in a household. Higher wages may facilitate the leaving of poor home environments. When women have more bargaining power, because of better outside options, partners may engage less in violent, threatening or controlling behaviour. Grogan (2023) finds that employment in the high-paying ready-made garment sector in Lesotho causally improved control over fertility and say in household decisions. Women who spend more time outside of the home, and away from their partner, might also be less exposed to the possibility of violence. However, new conflicts about household responsibilities or perceived transgressions might result from a woman obtaining new or better work opportunities.

The gradual rollout of EPZs in Nicaragua is here exploited to focus on how several aspects of women's relationships with their partners and views of violence change with new employment prospects. Data on three types of outcomes is employed: (*i.*) experiences of IPV, (*ii.*) women's views of the acceptability of IPV for various domestic infractions, (*iii.*) their views of the roles of women and men in the household. A comparison is made of measured effects on the subjective, gender role, outcomes with the effects of new employment on IPV. This analysis will help shed light on ways in which the acceptability of IPV may be differently altered from the observed incidence as women's employment increase. As well, women's adjustment of their roles in the household might be conditioned by new employment for reasons other than increased bargaining power. The data suggest that women may find violence less acceptable but also experience more IPV, and also support

more traditional gender roles as a result of their new employment.

The identification strategy and data employed follow Grogan (2025). This paper compares the impact of increased low-waged, salaried, non-agricultural employment on the incidence of partners' violence, threats and controlling behaviour. The employment of less-educated women is found to increase the incidence of all three types of outcomes. Backlash and instrumental motives for the observed increase in violence are shown to be potential channels of effects. These results are consistent with Bhalotra, Kambhampati, Rawlings, and Siddique (2021), who observe that 'male backlash' motives are most prevalent in poor countries where women have limited access to divorce. During 1998-2012, there was almost no formal divorce in Nicaragua, reproductive rights were severely circumscribed and legal protections against spousal violence were low (see, for example, Lancaster (1994) and Mann (2005)). The results for Nicaragua are similar to those of Eaten and Keskin (2021) in suggesting an increase in instrumental motives for IPV as a result of new manufacturing jobs in Cambodia, those of Chong and Velásquez (2024) for Peru, with a meta-survey of Vyas and Watts (2009), with Khan and Klasen (2018) using the DHS Latin American surveys, and Zhang and Breunig (2023) for Australia. Where instrumental or male backlash motives for violence rise for women working in EPZs, increases in their relative earnings may not act as a deterrent of IPV.

IPV is associated with a wide range of negative wellbeing consequences. Women who are abused by their partners may suffer long-lasting physical and emotional injuries. Children who grow up in violent households experience compromised physical and emotional development, even if they are not direct victims (see, for example, Fantuzzo and Mohr (1999), Thompson, Saltzman, and Johnson (2003), Romito, Turan, and De Marchi (2005), Fischbach and Herbert (1997), Loxton, Schofield, and Hussain (2006), Fanslow, Norton, and Spinola (1998), Ellsberg, Pena, Herrera, Liljestrand, and Winkvist (1999), Ellsberg, Winkvist, Peña, and Stenlund (2001), and Kyriacou, Anglin, Taliaferro, Stone, Tubb, Linden, Muelleman, Barton, and Kraus (1999)). These effects may be carried into adulthood and contribute to a cycle of violence (Levendosky and Graham-Bermann (1998)). Children who witness violence have lower health index scores and may develop behavioral, social, and mental health problems such as post-traumatic stress disorder, anxiety, depression, and aggressiveness (Huth-Bocks, Levendosky, and Semel (2001, Bair-Merritt, Blackstone, and Feudtner (2006, McDonald, Jouriles, Norwood, Ware, and Ezell (2000)).

Understanding 'male backlash' is important to reconciling common observations from poor contexts with the idea that violence should decrease as women's bargaining power rises. In a study of women's lives in León, Nicaragua, Ellsberg, Peña, Herrera, Liljestrand, and Winkvist (2000) found that strong feelings of jealousy and the desire to re-establish control over women were amongst the most common reasons cited by women for their partner's violent acts. Perhaps because of Nicaraguan women's historic lack of economic opportunities and legal rights, male backlash appears particularly important in this context (Lancaster (1994), Berglund, Liljestrand, de María Marín, Salgado, and Zelaya (1997) and Welsh (2001)). Grogan (2025) shows that new EPZ employment caused women's partners to increase their weekly alcohol consumption. Violence might increase as a response to uncertainty of paternity or jealousy of woman's greater contact with non-family males (see, for example, Eswaran and Malhotra (2009)). Whereas women are likely work within sight of partners in agricultural work, they are less likely to be observed and monitored when working in EPZs. In contexts where backlash effects dominate those of increased bargaining power, women likely modify their behaviour within the household to mitigate potential violence and resource extraction. The greater financial autonomy afforded by higher potential earnings may not then facilitate more cooperation amongst partners. To date such channels have been little-examined.

Analysis is facilitated by the rich survey data collected since 1998 by the Nicaraguan Statistical Agency INIDE, in conjunction with the World Bank and USAID. The 1998 Demographic and Health Survey (DHS) and two subsequent locally-implemented followups included both subjective and objective measures of women's status in their households. Locally-implemented followups were modelled on the DHS questionnaire. A nearly-identical set of questions was posed in the same order, under similar protocols about the presence of non-participants. Samples are large. Partners' employment, education and geographic information is included. In contexts where bargaining power effects of women's employment might be secondary to those of backlash and instrumental motives for violence, such longitudinal data may have the potential to provide many more insights than those of hospital admission or other administrative data.

EPZ arrival in a municipality affected employment prospects of women with and without any secondary education differently. Agreements reached between foreign investors and municipalities substantially increased demand for low-paid factory labour at different

times in each municipality. During 1998-2012, new EPZs were almost exclusively light manufacturing firms with less-educated female employees. Amongst these, most were engaged in textile production. EPZs increased employment prospects of women without secondary education, but not those of their partners or of better-educated women. These factors facilitate identification of the causal impact of less-educated women's employment on views of the acceptability of violence, resource control and gender roles. As of 2012, the oldest surviving EPZ was a textile firm in Las Mercedes in the municipality of Managua, which had been founded in 1992. Even in 2021, women continued to comprise the majority of employees in EPZs in Nicaragua (OXFAM (2022)).

The paper proceeds as follows. Section 2 introduces the data and provides summary statistics from repeated cross-sections spanning 1998-2012. In Section 3, the causal impact of women's employment in EPZs on violence, resource control and subjective empowerment questions is identified using instrumental variable (IV) and triple-differences (DDD) estimation. The impact of EPZ arrival on women's views of violence and household gender roles is examined. Section 4 concludes.

2 Data and Summary Statistics

Data from three nationally-representative demographic and health surveys are combined to create a repeated cross-section spanning 1998-2012. The Nicaragua 1998 Demographic and Household Survey (DHS), the 2006-7 Reproductive Health Survey and the 2011-12 Survey of Nicaraguan Demography and Health (ENDESA) contain identical questions about labour supply, socioeconomic characteristics of women and their partners, marital and fertility histories and non-cooperative behaviours (ICF International (1998), ENDESA (2006), ENDESA (2012)). Women aged 15-49 are included. Questions about IPV experienced in the previous twelve months and about controlling behaviour are posed to respondents in the absence of their partners. The sample frame and questionnaires employed in the two later surveys, undertaken by the Ministry of Health and the National Institute for Information on Development, are taken directly from the 1998 DHS. The combined surveys span a fourteen year period of rapid EPZ expansion. These surveys are discussed in more detail in Data Appendix A.

The proliferation of EPZs coincided with an increase of exports of goods, services

and incomes from Nicaragua from in 404 million current USD in 1990 to 5385 million by 2020 (World Bank (2021)). This is shown in Figure 1. EPZs usually comprise groups of labour-intensive factories clustered in industrial areas of municipalities. Data from the yearbooks of the National Commission of Export Processing Zones (CNZF) show that EPZs expanded across the western region during the 1998-2012 period (Commisión Nacional de Zonas Francas de Nicaragua (2020)). The CNZF approves municipalities as sites for EPZs (Picarelli (2016)). Municipal officials then negotiate directly with export-oriented firms which have been granted 'free trade status' by the national government. Some firms join existing industrial parks, while others build independent plants close to the residences of potential workers. In 1998 there were four municipalities, including Managua, which hosted at least one EPZ. By 2012, EPZs were present in 22 municipalities. Several municipalities, including Managua, housed multiple EPZs. Figure 2 shows the locations of municipalities hosting EPZs in Nicaragua during 1998-2012. By March of 2012, EPZs employed more than 103 000 workers (El nuevo diario Nicaragua (2012)).

Women are coded as employed in low-skilled, salaried, non-agricultural, non-family work. Employment can be categorized as agricultural or non-agricultural. The occupational codes included in the DHS can be used to distinguish non-agricultural employment in low-skilled work from higher-skilled employment in managerial, professional and skilled technical occupations. Respondents provide information on payment in cash or kind and about whether or not their employer is a family member. Several additional questions are posed in these surveys about the nature of farmed land, seasonality of work and modes of payment for agricultural labour. Despite the lack of industry codes or detailed information about workplaces, this coding is argued to capture new manufacturing employment.

The combined DHS and ENDESA data show that employment for both less- and more-educated women changed during 1998-2012. These means are presented in Table 1. Paid employment of less-educated women in agriculture was about 6-7% in 1998 and in the combined 2006-12 data (column (1)). The rate of low-skilled, salaried, non-agricultural employment was higher for women with more education before the major expansion of EPZs (column (2)) but similar afterwards (column (5)). For less-educated women, such employment increased from 21% in 1998 to 30% in the combined 2006-12 data. After the collapse of communism, the government stimulated manufacturing industries through regulatory changes and direct infrastructure investments. EPZs became major employers

of less-educated women in some municipalities.

Very few women without secondary education were engaged in other forms of non-agricultural employment in either the earlier or later periods (column (3)). In contrast, about 20% of women with at least some secondary schooling were working in higher-skilled non-agricultural paid employment in 1998 (column (6)). This had declined slightly to about 17% in later years, suggesting that EPZ arrival did not increase availability of higher-skilled non-agricultural employment. These changes are broadly consistent with those observed in the Integrated Public Use Microdata Census Samples (IPUMS) of 1971, 1995 and 2005 for Nicaragua. The IPUMS data are discussed in more detail in Data Appendix A.

Both the order of questions posed to respondents and protocols regarding family member presence are consistent across surveys. In all three surveys, subjective questions are posed about the acceptability of violence from partner as retribution for domestic deficiencies for which a woman might be held responsible. In the ENDESA surveys, these questions are preceded by six subjective questions about control over resource allocation decisions in households. Identical, focused questions about IPV and controlling behaviour then follow. The richer set of (pre-IPV) questions posed in the ENDESA surveys may possibly affect subsequent responses to questions common to all three surveys. This possibility will be accounted for in multivariate estimation.

Questions posed regarding threats, IPV and controlling behaviour are consistent across the three surveys comprising the pseudo-panel. To assess the presence of threats, respondents were asked whether or not a partner had engaged in the following: attempts to humiliate, threats to hurt, threats to get sex, or threats with weapons. Questions posed about violence included whether or not a partner had: pushed or shaken, slapped or twisted an arm, hit with fist, kicked, tried to strangle, forced for sex, or forced for sex with a gun. These responses are here combined into one outcome variable indicating whether a respondent had experienced any threats or violence in the previous twelve months. This is the IPV indicator.

The responses to the violence module in the combined DHS and ENDESA surveys suggest that non-agricultural employment is associated with a higher incidence of IPV, for both less- and more-educated women. Amongst both groups of women those engaged in low-skilled non-agricultural employment experience more IPV. This is shown

for less-educated women in column (1) of Table 2, Panels A and B. The fraction of less-educated women reporting IPV from a partner in the previous twelve months was higher amongst those engaged in low-skilled, salaried non-agricultural employment (columns (1)). Amongst women with at least some secondary education, this was also true (Panel B, column (1)). The respective means by employment status are, however, lower than those for less-educated women. Less-educated women generally experience more IPV.

Nearly one third of respondents report that there had been violence in their childhood homes. Salaried non-agricultural employment is also associated with a greater likelihood that a woman reported previously observing IPV between her parents. This is shown in Column (2) of 2, Panels A and B. Amongst less-educated women in salaried employment outside agriculture, about 0.29 previously observed such violence, compared to about 0.24 amongst those without such employment. A similar positive difference in this outcome is also observed for women with some highschool education (Panel B, column (2)). These results suggest one channel of endogeneity between women's employment to IPV in her childhood living circumstances.

The pseudo-panel includes responses to questions about the perceived acceptability of spousal violence (Spanish verb *maltratar*) for several negative situations for which a woman might be considered at fault: She is unfaithful, she neglects domestic responsibilities including children, she goes out without permission or she refuses sex. These same questions were posed respondents before those about experiences of violence in all years. Less-educated women in non-agricultural employment are less accepting of violence in each of these situations than those without such employment (columns (3)-(6), Panel A). A similar pattern holds for women with some secondary schooling (columns (3)-(6), Panel B). Differences by employment status are again relatively large for less-educated women. Both groups of women find violence less acceptable but experience more IPV when they obtain this type of work.

The 2006/07 and 2011/12 ENDESA surveys also include a series of further questions about gender norms in a respondent's household. Means of these outcomes are presented, by women's employment status and education, in Table 3. Women are not more likely to report that using violence to discipline children is acceptable (*castigo fisico*) if they are employed, for either education group (column (1), Panels A and B). Women are, however, less likely to agree with the statement that "Women should obey their partner even if

they disagree with him" if they have salaried non-agricultural work (column (2), Panels A and B). Employment is not, however, associated with different levels of agreement with the statement "Family problems should only be discussed in the household" [...when abuse occurs] (column (3)), either for more or less-educated women. Employed women are, however, less likely to agree that "The man has to show his partner who is the boss of the household" (column (4)), that "Women are obliged to have sexual relations with their partner even if they don't want to" (column (5)). Women in both education groups are also less likely to agree that "When a man abuses (*maltrata*) his partner, outsiders should intervene" if they have such employment (column (6)).

Women's anthropometry and partners' educational attainment data are included in all three survey rounds. These are potentially precise objective measures of women's situations. Amongst less-educated women, both height and weight are significantly greater if they are engaged in low-waged, skilled non-agricultural employment (Panel A, columns (7) and (8)). As well, partners of these working women are relatively unlikely to be without secondary education (Panel A, column (9)). For women with at least some secondary education (Panel B), differences are found only for women's weight. Those engaged in such employment are, on average, about two kilograms heavier than those who are not. Women's employment in EPZs should be unrelated to her adult height or to the educational attainment of her partner, under the identification strategy to be employed. In contrast, women's weight may well be affected by her new work: She may expend more energy in this new activity, but she will also earn cash which may be spent partially on food. Since the same trained expert measured and noted both height and weight within a very short time frame, differences in measured effects on these outcomes may be very useful for inference.

Other observable characteristics of those employed in low-skilled, salaried employment outside of agriculture also differ from those without such work. A comparison of these means is presented and discussed in Data Appendix A. For women in both education groups, available measures of socio-economic status suggest that those in low-skilled non-agricultural work have greater economic status than those without.

The 1993 LSMS/EMNV survey permits comparison of the infrastructure and household consumer durables provisions in municipalities which would and would not later host an EPZ. Consistent with EPZs requiring substantial electricity and water provisions, there

are salient differences in these outcomes in 1993 across the two municipality types. A table of means is presented and discussed in more detail in Data Appendix A. These pre-study differences are not necessarily a cause for concern in estimation: Within municipalities, women with some secondary education will comprise the control group under the major estimation strategy. Municipal fixed effects can be employed in all multivariate analysis.

2.1 Pre-trends by educational attainment?

Municipalities that obtained EPZs during 1998-2012 may have been very different than those that did not. There may have been general impacts of EPZ arrival in municipalities, experienced by both those who did and did not gain employment in these firms. For this reason, identification relies on comparing groups more and less-affected by EPZ arrival: women with only primary education and those with at least some secondary education.

Despite having only three rounds of data spanning a fourteen year period, this identifying assumption can be at least partially explored. In Grogan (2025) the labour supply information contained in the 1993 and 1998 LSMSes is used to examine potential pre-trends in low-skilled, non-agricultural salaried employment. Mean differences in such employment across education groups in 1993 and 1998 are compared. The gap in employment rates across education groups is shown to be statistically the same in both years. On this dimension, the data support an assumption of no differential pre-trends across treatment and control groups. Women with some secondary education had greater levels of salaried non-agricultural employment in both years, but the difference was relatively constant. Partners' employment was also shown to be unaffected by EPZ arrival, for either less or more-educated women. A simulation of one hundred counterfactual EPZ disseminations also suggests that the measured causal impacts were unlikely to have been a result of time-varying unobservables correlated with the rollout.

3 Estimation

The decision for women to seek paid employment outside of agriculture is likely endogenous to the household situation. One reason why women may work more in violent households is that they are planning to leave their partners, and need to be able to cover their living expenses when they are single (Bowlus and Seitz (2006)). This precautionary sav-

ings motive might be particularly strong where legal protections in the case of violence or separation are weak, as in Nicaragua during 1998-2012. Non-cooperation within the household may have psychological or physical health impacts, which lead to a reduction in potential labour supply (see, for example, McDonald, Jouriles, Norwood, Ware, and Ezell (2000), Huth-Bocks, Levendosky, and Semel (2001), and Bair-Merritt, Blackstone, and Feudtner (2006)). If the propensity of partners to extract resources from a woman, or to reassert control, is higher when she earns more money, the incentive to work might also be tempered. Increased labour supply might also be a response to a partner's IPV-facilitated rent-seeking (see, for example, Gedikli, Popli, and Yilmaz (2023), Liu and Olamijuwon (2024)).

In addition to endogeneity of employment status, attenuation bias may be a concern in analysis. Misclassification of women's employment may impede inference from OLS. The natural experiment provided by the time-varying rollout of EPZs, and their recruitment policies permits assessment of the causal impacts of these new opportunities on the incidence of IPV, anthropometric outcomes, attitudes of women towards IPV and gender norms at home. Responses to the universe of questions posed on a topic are employed as outcomes, to dissuade readers that results may be dismissed as 'cherry-picking'.

3.1 IV Estimation

Firststage estimation employs staggered triple-differences:

$$\begin{aligned} LOWSKILL_{imt} &= \beta_0 + \beta_1 NOSEC_{imt} + \beta_2 EPZ_{imt} + \beta_3 NOSEPZ_{imt} \\ &\quad + \beta_4 AGE_{imt} + \beta_5 TOTKID_{imt} + \beta_6 MAR_{imt} + \sum \delta_g INFRA_{m,t-1} \\ &\quad + \sum \sigma_d EARNINGS_{m,t-1} + \mu_m + \gamma_1 * y2007 + \gamma_2 * y2012 + \epsilon_{imt} \end{aligned}$$

The probability of a woman i having such an outcome in municipality m at time t is explained as a function of EPZ presence in the municipality and year, the education dummy $NOSEC$ and an interaction term with EPZ presence ($NOSEPZ$), two time dummies and municipal fixed effects (μ_m).

The preferred specifications also include controls for potential time-varying local economic conditions. Information on the prevalence of piped water, electricity, sanitation

and dirt floors is collected in all nationally-representative household surveys of Nicaragua. The Living Standards Monitoring Studies (LSMS/EMNV) of 1993, 1998 and 2005 also collected individual earnings information (National Institute of Statistics and Census, Nicaragua (2010)). In estimation, these surveys are used to create lagged municipal-level infrastructure and labour market means to control for conditions in the period prior to EPZ arrival.

Triple-difference estimation shows that EPZ arrival increased the relative probability that less-educated women engaged in low-skilled, salaried non-agricultural employment. This is shown for the combined sample of women in Table 4. In the full sample (Panel A), the arrival of EPZs increased the relative employment rate of women without secondary (β_3), by about 0.07, *ceteris paribus*. Estimates are substantively the same across specifications (1)-(4). The inclusion of lagged infrastructure and labour market controls (columns (2)-(4)) does not change the coefficients of interest. Differences in pre-trends in these variables are unlikely to be a source of bias in inference. The EPZ dummy β_2, is not statistically significant in any case, consistent with the stylised fact that EPZs hired mainly women without secondary education during 1998-2012.

The IV exclusion restriction implies that EPZ arrival affects the behaviour of less-educated women's partners differentially only because of these women's greater likelihood to be recruited for such employment. EPZ arrival in a municipality may induce general changes in prices and availability of goods. Under the assumption that such effects are similar across less- and more-educated women and their partners, an EPZ hiring preference for low-skilled workers will identify causal impacts on IPV and partners' behaviour.

There were enough new EPZs founded between the 2006/07 ENDESA and the 2011/12 round that EPZ arrival in a municipality also predicts a relatively great employment jump in this subsample. This is shown in Panel B of Table 4. This is important because the questions regarding gender roles were posed only in these two subsequent surveys. For this reason, the strong explanatory power of the $EPZ * NOSEC$ variable is very helpful in identification and in interpreting what is happening to gender norms in households.

Clearly, there remain other potential ways in which an exclusion restriction might be violated in the firststage regressions. For this reason, observing robustness of estimates to the inclusion of the rich set of lagged, time-varying municipal level controls may be particularly important.

The main equation to be estimated takes the form:

$$\begin{aligned} OUTCOME_{imt} &= \beta_0 + \beta_1 \widehat{LOWSKILL}_{imt} + \beta_2 AGE_{imt} \\ &\quad + \beta_3 TOTKID_{imt} + \beta_4 MAR_{imt} + \sum \delta_g INFRA_{m,t-1} + \ldots \\ &\quad + \sum \sigma_d EARNINGS_{m,t-1} + \mu_m + \gamma_1 * y2007 + \gamma_2 * y2012 + \epsilon_{imt} \end{aligned}$$

The incidence of IPV causally increased as a result of women's new employment in EPZs, as measured by the exhaustive and consistent range of specific questions posed on violence and threats. Panel A of Table 5 presents OLS and IV results. In the preferred specification of column (8), the probability of IPV in the previous 12 months increased by 0.58 when a woman obtained salaried non-agricultural employment. The larger IV than OLS coefficients are consistent both with both an under-reporting of threats and violence and with endogeneity of this outcome to women's employment.

The firststage regression should overcome potential endogeneity between childhood observance of IPV and a woman's current employment and domestic circumstances. This appears to be the case in IV specifications. This is shown in Panel B of Table 5. In neither the preferred specification (column (8)), nor any other IV specification, is a statistically-significant impact observed. This provides some reassurance that the identification strategy is sound.

Respondents do not become more accepting of a partner's violence for common, hypothetical, domestic mistakes which might be considered transgressions of household gender roles. This is shown in Panels C1 through C4 of Table 5. Respondents are much less likely to agree that violence is justified if a'woman neglects her domestic responsibilities' or if she 'goes out without informing her partner' as a result of the new employment associated with EPZs. New non-agricultural, salaried employment also does not observably impact a woman's perception of the acceptability of violence for child discipline. This is shown in Panel A of Table 6.

A woman's view of household gender roles does not become more progressive as a result of her obtaining non-agricultural salaried employment. Such employment increases the probability that she agrees that a woman should obey her partner by about 0.74 (Panel B). Effects on her view about whether or not a woman should remain silent (about abuse) for the good of the family are not statistically significant at the 5% level (Panel C).

She is much more likely to agree that the man is the boss in the home as a result of being employed in salaried non-agricultural work (Panel D). This work does not affect her views about sexual obligations to partners (Panel E) or whether outsiders should intervene in affairs of the household (Panel F). Results are very consistent across IV specifications with or without extensive socio-economic and time-varying municipal controls.

3.2 Reduced form DDD estimates

In general, reduced-form estimates concur with those of the IV specifications. These specifications include identical control variables to the firststage regressions in IV specifications. Results are presented in Tables 7 and 8. To summarise, the signs and statistical significance (or lack thereof) of coefficients are as those in the preceding IV specifications. For none of the outcomes examined does inference change across estimation methods.

The arrival of EPZs in a municipality increases the relative incidence of violence and threats experienced by less-educated women in the past 12 months by about 0.04. These results are shown in Panel A of Table 7, columns (1)-(4)). Results hardly differ from the simplest specification (column (1)) to that including socioeconomic, municipal infrastructure and (lagged) labour market controls (column (4)). However, as would be expected, no causal impact on the incidence of violence between a woman's parents during her childhood is observed (Panel B).

As with the IV specifications, the DDD results show that more experience of IPV does not coincide with greater reported acceptance of violence for theoretical domestic transgressions. For none of the four vignettes common across surveys is a positive and statistically significant effect observed in the preferred specification (Panels C1-C4, column (4)). For two outcomes, 'neglect of domestic responsibilities' and 'going out without partners' permission' the measured causal impact is statistically significant and negative. These subjective responses, collected by interviewers before the posing of the detailed IPV questions, suggest that EPZ arrival widened a gap between low-educated women's beliefs and experiences of IPV.

3.3 Multiple hypothesis testing and inference from subjective response

The preceding analysis includes two-way clustered standard errors, but does not adjust standard errors for the number of outcomes examined. As the number of (correlated) outcomes to be examined expands, a researcher is more likely to find some statistically significant impacts. This will be the case even if an intervention has no impact on any margins at all. The small sample sizes typical of expensive experiments mean that slight differences in the calculation of standard errors may alter inference. Empirical researchers increasingly correct standard errors for 'multiple hypothesis testing'. These corrections generally slightly increase the probability of accepting a null hypothesis for each outcome. Because of the formulas typically invoked, the more outcomes examined, the larger is the resulting change in standard errors. Commonly-used correction formulae give equal weight to all outcomes examined, without regard to their real-world relevance or proximity to the research question being addressed.

Arguably, the finding that the results do not suggest easy congruity across subjective and objective responses is of importance to designing surveys about wellbeing and living standards of household members. For two of the four questions posed about the perceived acceptability of partners' violence for domestic infractions, no statistically-significant causal impacts are found. For two others, which may be more or less relevant to women's wellbeing, measured negative effects of employment are robustly statistically significant. Given the strong and robust causal effects of EPZ employment on IPV, a series subjective responses that might be considered nebulous in other contexts might here be assigned a more substantive interpretation. A similar argument can be made for the gender roles responses. The reported outcomes, comprising the universe of gender role questions posed in ENDESA surveys, certainly do not provide support for a hypothesis that employment always improves women's status in her household.

3.4 Further analysis

Women's anthropometry and partner's socioeconomic measures are included in all three rounds of the DHS/ENDESA. Women's heights and weights are recorded by trained interviewers in all rounds. These can also be used to assess the plausibility of the estimation

strategy. The interaction term between EPZ arrival and secondary schooling should not be statistically significant for outcomes completed prior to EPZ arrival. A woman's current height and her partners' educational attainment should not have been impacted by EPZ placement. In Panels A and B of Table 9 I show that this is the case. The arrival of an EPZ in a municipality causes less-educated women's weights to increase by about 1-1.5 kilograms, *ceteris paribus* (Panel C). Despite low wages, basic working conditions and the changes induced in home environments, newly-employed women do apparently benefit from increased food consumption. In Data Appendix B, these results are shown to be very similar using IV specifications.

4 Conclusions

This paper compares the impact of the expansion of low-wage manufacturing employment in Nicaragua during 1998-2012 on three types of outcomes for women: The incidence of IPV, perceptions of the acceptability of violence for minor household infractions, and perceptions of gender roles in the household. The data comprise repeated cross-sections, and contain identical, detailed questions on IPV, partners' behaviour, and women's views. During the study period, new export processing zones hired primarily less-educated women and employment of those with more education was not impacted.

The identification strategy follows Grogan (2025) in exploiting the timing of arrival of export processing zones to a municipality, and the nature of their recruitment. During 1993-1998 no differential trends in the incidence of low-skilled, salaried, non-agricultural employment were observed across educational groups. The subsequent stronger impact of EPZ arrival on less-educated than more-educated women's employment is used in first-stage regressions. This identification strategy permits EPZ arrival in a municipality to induce more general municipality-level socioeconomic changes. During 1998-2012 partners of less-educated women did not obtain employment in EPZs with their arrival in a municipality. Outcomes which should have been unaffected under a valid identification strategy were not: No causal effects were found on the probability of IPV between parents in the natal household, partner's education or employment, or on her adult height, as measured in the anthropometry module of the surveys.

All questions posed about violence in multiple rounds were used to help understand

employment impacts on interactions between partners. These include a question about a woman's childhood observations of violence between parents. The historical information is shown to examine the plausibility of the identification strategy. A question about women's current views about disciplining children with violence helps distinguish general changes in attitudes towards violence in the home from those specific to IPV.

The findings provide evidence of multifaceted effects of employment and wellbeing outcomes for women in a context where women's legal rights are circumscribed and their earnings power is low. The reported incidence of threats and violence in the previous 12 months unambiguously increases with EPZ employment. Such work decreases the reported acceptability of violence for minor domestic infractions. More traditional views of the roles of men and women are expressed as a result of EPZ arrival, perhaps suggesting that self-protective concessions to backlash plus continued employment are preferable to leaving this work. The fact that women spend less time at home when they go out to work, may also make the adherence to more traditional norms less taxing. Less-educated women, who generally weigh less than those with more education, do appear to moderate this gap with EPZ arrival in their municipality.

These results suggest that new employment for women can change both the realities of their living circumstances and also more abstract notions of gender equality in ways which may seem incongruous to economists: Women's employment may both reduce the reported acceptability and increase the probability of experiencing violence from partners. Newly-employed women might, without contradiction, report adherence to more traditional household gender roles and become less accepting of spousal violence. The presence of backlash and women's adjustments in their home roles may be particularly important for understanding wellbeing effects of manufacturing in low-wage contexts where divorce remains infeasible.

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Table 1: Employment of women by educational attainment, Nicaragua 1998-2012

	No secondary education			Some secondary education		
SECTOR:	**agriculture**	**low-skilled salaried**	**other non-agri.**[a]	**agriculture**	**low-skilled salaried**	**other non-agri.**[a]
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 1998						
	0.0682	0.2083	0.0095	0.0096	0.2496	0.2010
	(0.004)	(0.006)	(0.001)	(0.002)	(0.009)	(0.008)
No.obs.	4258	5325	5325	1671	2228	2228
Panel B: (2006, 2011/12)						
	0.0667	0.2962	0.0110	0.0353	0.2972	0.1708
	(0.003)	(0.005)	(0.001)	(0.002)	(0.005)	(0.004)
No.obs.	6096	8399	8399	7096	9967	9967
Difference (B-A)						
	-0.0015	0.0879***	0.0015	0.0257***	0.0476***	-0.0302***
	(0.005)	(0.008)	(0.002)	(0.005)	(0.011)	(0.009)
No.obs.	10354	13724	13724	8767	12195	12195

Notes: Combined and re-weighted DHS 1998 and ENDESA 2006/7 and 2011/12 cross-sectional data. [a] Salaried managers, professional and skilled technical employees not working for family. Samples include women aged 15-49 who are married or have a partner. The municipality of Managua is excluded. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 2: Low-skilled, salaried non-agricultural employment and household outcomes, by woman's education

PANEL A: Women without secondary education						
			Acceptability of partner beating when woman...			
	Violence or threats 12 ms	**IPV parents' hhld**	**is unfaithful**	**Neglects dom (kids)**	**Goes out no permis**	**Refuses sex**
	(1)	(2)	(3)	(4)	(5)	(6)
A1: No low-skilled salaried work						
	0.1436	0.2436	0.1904	0.1166	0.1256	0.0551
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
No.obs.	10332	10004	10332	10332	10332	10332
A2: Low-skilled salaried work (non-agricultural)						
	0.2122	0.2882	0.1331	0.0811	0.0802	0.0300
	(0.007)	(0.008)	(0.006)	(0.005)	(0.005)	(0.003)
No.obs.	3365	3284	3365	3365	3365	3365
Difference (A2-A1)						
	0.0685***	0.0446***	-0.0573***	-0.0354***	-0.0453***	-0.0252***
	(0.007)	(0.009)	(0.007)	(0.006)	(0.006)	(0.004)
No.obs.	13697	13288	13697	13697	13697	13697
PANEL B: Women with some secondary education						
			Acceptability of partner beating when woman...			
	Violence or threats 12 ms	**IPV parents' hhld**	**is unfaithful**	**Neglects dm (kids)**	**Goes out no permis**	**Refuses sex**
	(1)	(2)	(3)	(4)	(5)	(6)
B1: No low-skilled salaried work						
	0.1546	0.2371	0.0887	0.0419	0.0456	0.0189
	(0.004)	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)
No.obs.	8766	8676	8766	8766	8766	8766
B2: Low-skilled salaried work (non-agricultural)						
	0.1797	0.2783	0.0681	0.0209	0.0306	0.0083
	(0.007)	(0.008)	(0.004)	(0.002)	(0.003)	(0.002)
No.obs.	3427	3396	3427	3427	3427	3427
Difference (B2-B1)						
	0.0251***	0.0412***	-0.0206***	-0.0211***	-0.0150***	-0.0106***
	(0.007)	(0.009)	(0.006)	(0.004)	(0.004)	(0.002)
No.obs.	12193	12072	12193	12193	12193	12193

DHS and ENDESA 1998, 2006/7 and 2011/12 data. Respondents with primary education or less. [a] Samples include women aged 15-49 who are married or have a partner. The municipality of Managua is excluded. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 3: Low-skilled, salaried non-agricultural employment and gender roles, by woman's education

	Woman's views of gender roles...						Anthropometry		
	Violence disc. children?	**Obey partner**[a]	**Silent for family**	**Man is boss**	**Woman oblige s**	**Outsiders intervene**	**height (cm)**[b]	**weight (kg)**[c]	**partner no secondary**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PANEL A: Women without secondary education									
A1: No low-skilled salaried work									
	0.1384	0.6023	0.7109	0.5769	0.1889	0.5042	153.1375	60.8982	0.7693
	(0.004)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.059)	(0.119)	(0.004)
No.obs.	6096	6096	6096	6096	6096	6096	9768	9646	9136
A2: Low-skilled salaried work (non-agricultural)									
	0.1357	0.5036	0.7074	0.4733	0.1188	0.4799	153.5599	64.7860	0.6825
	(0.007)	(0.010)	(0.009)	(0.010)	(0.007)	(0.010)	(0.105)	(0.221)	(0.009)
No.obs.	2303	2303	2303	2303	2303	2303	3204	3152	2726
Difference (A2-A1)									
	-0.0028	-0.0987***	-0.0035	-0.1035***	-0.0701***	-0.0243**	0.4224***	3.8878***	-0.0868***
	(0.008)	(0.012)	(0.011)	(0.012)	(0.009)	(0.012)	(0.117)	(0.239)	(0.009)
No.obs.	8399	8399	8399	8399	8399	8399	12972	12798	11862
PANEL B: Women with some secondary education									
	Woman's views of gender roles...						Anthropometry		
	Violence disc. children?	**Obey partner**[a]	**Silent for family**	**Man is boss**	**Woman oblige s**	**Outsiders intervene**	**height (cm)**[b]	**weight (kg)**[c]	**partner no secondary**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
B1: No low-skilled salaried work									
	0.1362	0.4140	0.6717	0.3616	0.1338	0.5010	154.3363	63.1977	0.3550
	(0.004)	(0.006)	(0.006)	(0.006)	(0.004)	(0.006)	(0.066)	(0.131)	(0.006)
No.obs.	7096	7096	7096	7096	7096	7096	8140	8001	7414
B2: Low-skilled salaried work (non-agricultural)									
	0.1246	0.3550	0.6792	0.2828	0.0763	0.4788	154.4368	65.3278	0.3386
	(0.006)	(0.009)	(0.009)	(0.008)	(0.005)	(0.009)	(0.103)	(0.219)	(0.009)
No.obs.	2871	2871	2871	2871	2871	2871	3247	3186	2688
Difference (B2-B1)									
	-0.0115	-0.0590***	0.0075	-0.0788***	-0.0575***	-0.0222**	0.1005	2.1302***	-0.0164
	(0.007)	(0.011)	(0.010)	(0.010)	(0.007)	(0.011)	(0.122)	(0.248)	(0.011)
No.obs.	9967	9967	9967	9967	9967	9967	11387	11187	10102

ENDESA 1998, 2006/7 and 2011/12 data. Note that the DHS 1998 did not include these questions. Respondents with primary education or less. [a] Samples include women aged 15-49 who are married or have a partner. [a] The full text includes "...even when she disagrees." [b] Women whose measured height is below 120cm or above 200 cm are excluded, less than 1% of the sample. [c] Women whose measured weight is below 40 kg or above 110 kg are excluded, less than 2% of the sample. The municipality of Managua is excluded. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 4: Firststage regressions: EPZs and the probability that a woman is employed in low-skilled salaried employment outside of agriculture (DDD)

Panel A: DHS 1998, ENDESA 2006 and 2011/12 (1998-2012)				
Dependent variable: Woman is employed				
	(1)	(2)	(3)	(4)
EPZ*no secondary	0.0762***	0.0792***	0.0736***	0.0737***
	(0.018)	(0.018)	(0.017)	(0.017)
EPZ	0.0397	0.0361	0.0364	0.0366
	(0.026)	(0.034)	(0.031)	(0.031)
No secondary	0.0107	0.0088	0.0091	0.0109
	(0.008)	(0.008)	(0.008)	(0.008)
age			0.0057***	0.0061***
			(0.000)	(0.001)
married			-0.1524***	-0.1511***
			(0.011)	(0.011)
no. children				-0.0029
				(0.002)
N.obs	25919	24884	24884	24884
R-squared	0.07	0.08	0.10	0.10
F-stat IV coeff.	18.1	20.2	19.2	19.5
Panel B: ENDESA 2006 and 2011/12 (for outcomes not included in DHS 1998)				
EPZ*no secondary	0.0894***	0.0911***	0.0811***	0.0812***
	(0.016)	(0.016)	(0.016)	(0.016)
EPZ	0.1695**	0.1673**	0.1506**	0.1503**
	(0.073)	(0.074)	(0.069)	(0.069)
No secondary	0.0120	0.0108	0.0144	0.0146
	(0.009)	(0.010)	(0.009)	(0.009)
age			0.0059***	0.0059***
			(0.001)	(0.001)
married			-0.1556***	-0.1554***
			(0.015)	(0.015)
no. children				-0.0005
				(0.003)
N.obs	18366	18110	18110	18110
R-squared	0.09	0.08	0.11	0.11
F-stat IV coeff.	30.5	31.4	27.0	26.8
Additional controls:				
muni. infra, m. earnings [a](t_{-1})	no	yes	yes	yes
age, marital status	no	no	yes	yes
no. children	no	no	no	yes

DHS and ENDESA 1998, 2006/07 and 2011/12 data. All specifications include municipal fixed effects and year dummies. Sample includes women aged 15-49 with partners. [a] One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded.

Table 5: Low-skilled, salaried non-agricultural employment, IPV, resource control and views of violence, Nicaragua 1998-2012

	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Any violence or threats in previous 12 months								
low-skilled, salaried work	0.0382***	0.5300**	0.0401***	0.5307**	0.0460***	0.5816**	0.0477***	0.5816**
	(0.006)	(0.211)	(0.007)	(0.206)	(0.006)	(0.238)	(0.007)	(0.231)
N.obs	25890	25890	24858	24858	25890	25890	24858	24858
F-stat	17.38	5.69	10.99	4.45	20.64	7.37	13.98	6.91
PANEL B: Violence between parents in childhood home								
low-skilled, salaried work	0.0305***	-0.0054	0.0309***	0.0127	0.0337***	-0.0093	0.0341***	0.0031
	(0.008)	(0.247)	(0.008)	(0.239)	(0.008)	(0.266)	(0.008)	(0.259)
N.obs	25360	25360	24426	24426	25360	25360	24426	24426
F-stat	21.72	17.04	13.21	10.36	15.54	13.44	16.37	12.23
PANEL C: Woman reports acceptability of beating from partner for ...								
C1: Woman is unfaithful								
low-skilled, salaried work	-0.0079	-0.1792	-0.0085	-0.1122	-0.0031	-0.1630	-0.0035	-0.0943
	(0.006)	(0.149)	(0.006)	(0.140)	(0.006)	(0.157)	(0.006)	(0.148)
N.obs	25890	25890	24858	24858	25890	25890	24858	24858
R-squared	0.10	0.02	0.10	0.06	0.10	0.03	0.11	0.07
C2: Woman neglects domestic responsibilities								
low-skilled, salaried work	-0.0024	-0.4044***	-0.0016	-0.3207***	0.0011	-0.4112***	0.0022	-0.3254***
	(0.003)	(0.120)	(0.003)	(0.100)	(0.004)	(0.125)	(0.003)	(0.105)
N.obs	25890	25890	24858	24858	25890	25890	24858	24858
F-stat	151.14	82.25	81.09	56.74	94.16	59.59	62.19	44.33
PANEL C3: Woman goes out without permission								
low-skilled, salaried work	-0.0044	-0.4695***	-0.0042	-0.4136***	-0.0014	-0.4785***	-0.0009	-0.4229***
	(0.004)	(0.151)	(0.004)	(0.138)	(0.004)	(0.159)	(0.004)	(0.146)
N.obs	25890	25890	24858	24858	25890	25890	24858	24858
F-stat	98.18	58.49	52.32	36.76	61.09	42.97	42.12	29.66
PANEL C4: Woman refuses sex								
low-skilled, salaried work	-0.0049**	-0.1535**	-0.0041**	-0.1076*	-0.0041**	-0.1585**	-0.0032	-0.1112*
	(0.002)	(0.064)	(0.002)	(0.062)	(0.002)	(0.068)	(0.002)	(0.065)
N.obs	25890	25890	24858	24858	25890	25890	24858	24858
F-stat	79.16	60.28	42.94	38.22	49.17	42.85	33.15	30.02
Additional controls:								
muni. infra, m. earnings [a](t_{-1})	no	no	yes	yes	yes	yes	yes	yes
age, marital status	no	no	no	no	yes	yes	yes	yes
no. children	no	no	no	no	no	no	yes	yes

DHS and ENDESA 1998, 2006/07 and 2011/12 data. Sample includes women aged 15-49 with partners, with and without secondary schooling. All specifications include municipal fixed effects and year dummies. [a] One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded. [b] Controlling behaviour comprises: Accuses of infidelity, jealous if talks to another man, needs to know whereabouts at all times, prohibits visiting friends, restricts access to family and needs permission for medical visits. Sample weights are employed. Residents of the municipality of Managua are excluded.

Table 6: Low-skilled, salaried non-agricultural employment and woman-reported gender norms, Nicaragua 2006-2012

	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Violence acceptable for child discipline								
low-skilled, salaried work	-0.0034	0.0806	-0.0030	0.0845	-0.0043	0.0808	-0.0041	-0.0287
	(0.006)	(0.141)	(0.006)	(0.139)	(0.006)	(0.159)	(0.006)	(0.150)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
F-stat	1.84	0.97	6.65	5.34	1.27	0.91	20.88	19.03
PANEL B: Woman should obey partner even when she disagrees								
	-0.0063	0.7963***	-0.0047	0.7968***	-0.0055	0.8423***	-0.0048	0.7361**
	(0.012)	(0.277)	(0.012)	(0.273)	(0.011)	(0.316)	(0.011)	(0.291)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
R-squared	0.08	-0.51	0.09	-0.51	0.09	-0.56	0.10	-0.41
PANEL C: Woman should keep silent for the family								
	0.0061	0.0549	0.0080	0.0764	0.0113	0.0949	0.0134	0.0994
	(0.009)	(0.219)	(0.009)	(0.216)	(0.010)	(0.243)	(0.010)	(0.239)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
F-stat	0.96	3.92	7.44	7.69	2.97	5.01	6.89	7.22
PANEL D: The man should be the boss in the home								
	-0.0174	0.7801***	-0.0178	0.7888***	-0.0146	0.8393***	-0.0157	0.7335***
	(0.011)	(0.292)	(0.011)	(0.287)	(0.011)	(0.306)	(0.010)	(0.285)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
F-stat	41.48	66.88	19.21	35.44	32.79	51.77	27.08	37.64
PANEL E: Woman is obliged to have s relations w partner								
	-0.0247***	0.0083	-0.0257***	0.0294	-0.0262***	-0.0342	-0.0275***	-0.0739
	(0.006)	(0.169)	(0.006)	(0.166)	(0.006)	(0.188)	(0.006)	(0.182)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
F-stat	40.55	31.19	18.56	18.59	26.57	24.77	17.14	17.55
PANEL F: Outsiders should intervene in affairs of household								
	-0.0086	-0.0733	-0.0090	-0.0806	-0.0112	-0.0428	-0.0113	-0.0419
	(0.009)	(0.270)	(0.009)	(0.266)	(0.010)	(0.304)	(0.010)	(0.301)
N.obs	18366	18366	18110	18110	18366	18366	18110	18110
F-stat	3.84	4.32	3.95	4.14	6.25	5.84	4.44	4.40
Additional controls:								
muni. infra, m. earnings $^{a}(t_{-1})$	no	no	yes	yes	yes	yes	yes	yes
age, marital status	no	no	no	no	yes	yes	yes	yes
no. children	no	no	no	no	no	no	yes	yes

ENDESA 1998, 2006/07 and 2011/12 data. Note that DHS 1998 data does not include these questions. Sample includes women aged 15-49 with partners, with and without secondary schooling. All specifications include municipal fixed effects and year dummies. ^{a} One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded. ^{b} Controlling behaviour comprises: Accuses of infidelity, jealous if talks to another man, needs to know whereabouts at all times, prohibits visiting friends, restricts access to family and needs permission for medical visits. Sample weights are employed. Residents of the municipality of Managua are excluded.

Table 7: Export processing zones, behaviour of partners, resource control, and views of violence Nicaragua 1998-2012

	(1)	(2)	(3)	(4)
PANEL A: Any violence or threats in previous 12 months				
EPZ*no secondary	0.0403***	0.0419***	0.0432***	0.0428***
	(0.013)	(0.013)	(0.013)	(0.013)
EPZ	0.0236*	0.0179	0.0179	0.0174
	(0.014)	(0.016)	(0.016)	(0.016)
No secondary	0.0023	0.0016	0.0015	-0.0031
	(0.007)	(0.007)	(0.007)	(0.007)
R-squared	0.02	0.02	0.02	0.02
PANEL B: Violence between parents in childhood home				
EPZ*no secondary	-0.0004	0.0010	0.0008	0.0002
	(0.019)	(0.019)	(0.019)	(0.019)
EPZ	0.0784***	0.0596***	0.0597***	0.0592***
	(0.019)	(0.021)	(0.021)	(0.021)
No secondary	0.0169**	0.0164**	0.0161**	0.0103
	(0.008)	(0.008)	(0.008)	(0.008)
R-squared	0.02	0.02	0.02	0.03
PANEL C: Woman reports acceptability of beating from partner for ...				
C1: Woman is unfaithful				
EPZ*no secondary	-0.0136	-0.0089	-0.0066	-0.0069
	(0.012)	(0.011)	(0.011)	(0.011)
EPZ	0.0482**	0.0176	0.0174	0.0170
	(0.021)	(0.021)	(0.021)	(0.020)
No secondary	0.0518***	0.0497***	0.0502***	0.0461***
	(0.007)	(0.007)	(0.007)	(0.007)
R-squared	0.10	0.11	0.11	0.11
C2: Woman neglects domestic responsibilities				
EPZ*no secondary	-0.0307***	-0.0253***	-0.0237***	-0.0240***
	(0.008)	(0.008)	(0.008)	(0.007)
EPZ	0.0613***	0.0427***	0.0425***	0.0422***
	(0.015)	(0.015)	(0.014)	(0.014)
No secondary	0.0367***	0.0333***	0.0337***	0.0308***
	(0.006)	(0.006)	(0.006)	(0.006)
R-squared	0.12	0.12	0.12	0.13
PANEL C3: Woman goes out without permission				
EPZ*no secondary	-0.0357***	-0.0327***	-0.0309***	-0.0311***
	(0.010)	(0.010)	(0.011)	(0.010)
EPZ	0.0365**	0.0152	0.0151	0.0148
	(0.014)	(0.014)	(0.014)	(0.014)
No secondary	0.0465***	0.0455***	0.0460***	0.0432***
	(0.006)	(0.006)	(0.006)	(0.006)
R-squared	0.09	0.09	0.10	0.10
PANEL C4: Woman refuses sex				
EPZ*no secondary	-0.0117**	-0.0085	-0.0080	-0.0082
	(0.005)	(0.005)	(0.005)	(0.005)
EPZ	0.0343***	0.0181***	0.0180***	0.0178***
	(0.006)	(0.006)	(0.006)	(0.006)
No secondary	0.0193***	0.0175***	0.0176***	0.0157***
	(0.003)	(0.003)	(0.003)	(0.003)
R-squared	0.05	0.05	0.05	0.05
Additional controls:				
muni. infra, m. earnings $^{a}(t_{-1})$	no	yes	yes	yes
age, marital status	no	no	yes	yes
no. children	no	no	no	yes

DHS and ENDESA 1998, 2006/07 and 2011/12 data. OLS estimation. All specifications include municipal fixed effects and year dummies. Sample includes women aged 15-49 with partners. ^{a} One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded.

Table 8: Export processing zones and gender norms in the household, Nicaragua 1998-2012

	(1)	(2)	(3)	(4)
PANEL A: Violence acceptable for child discipline				
EPZ*no secondary	0.0072	0.0077	0.0070	-0.0023
	(0.013)	(0.013)	(0.013)	(0.012)
EPZ	0.0032	-0.0088	-0.0092	0.0042
	(0.096)	(0.091)	(0.091)	(0.089)
No secondary	0.0033	0.0033	0.0033	-0.0037
	(0.007)	(0.007)	(0.007)	(0.007)
N.obs	18366	18110	18110	18110
R-squared	0.03	0.03	0.03	0.05
PANEL B: Woman should obey partner even when she disagrees				
EPZ*no secondary	0.0712***	0.0727***	0.0682***	0.0599***
	(0.019)	(0.019)	(0.019)	(0.019)
EPZ	-0.1060	-0.1112*	-0.1101*	-0.0982
	(0.069)	(0.067)	(0.067)	(0.064)
No secondary	0.1206***	0.1193***	0.1188***	0.1125***
	(0.012)	(0.012)	(0.012)	(0.012)
R-squared	0.10	0.11	0.11	0.11
PANEL C: Woman is should stay silent to keep family				
EPZ*no secondary	0.0049	0.0072	0.0100	0.0083
	(0.020)	(0.020)	(0.020)	(0.020)
EPZ	-0.0772**	-0.0928**	-0.0898**	-0.0874**
	(0.035)	(0.036)	(0.036)	(0.037)
No secondary	0.0272**	0.0262**	0.0256**	0.0243**
	(0.011)	(0.011)	(0.011)	(0.011)
R-squared	0.03	0.04	0.04	0.04
PANEL D: Man is the boss				
EPZ*no secondary	0.0697***	0.0720***	0.0692***	0.0597***
	(0.022)	(0.022)	(0.022)	(0.021)
EPZ	-0.1631	-0.1786	-0.1762	-0.1627
	(0.127)	(0.121)	(0.120)	(0.117)
No secondary	0.1474***	0.1461***	0.1454***	0.1383***
	(0.012)	(0.012)	(0.012)	(0.012)
R-squared	0.12	0.13	0.13	0.14
PANEL E: Woman obliged s relations partner				
EPZ*no secondary	0.0007	0.0027	-0.0009	-0.0060
	(0.015)	(0.015)	(0.015)	(0.015)
EPZ	0.0264	0.0128	0.0128	0.0201
	(0.020)	(0.014)	(0.014)	(0.013)
No secondary	0.0323***	0.0321***	0.0319***	0.0281***
	(0.009)	(0.009)	(0.009)	(0.009)
R-squared	0.06	0.07	0.07	0.07
PANEL F: Others outside home should intervene in partners' affairs				
EPZ*no secondary	-0.0066	-0.0066	-0.0035	-0.0027
	(0.024)	(0.024)	(0.024)	(0.025)
EPZ	0.0591**	0.0483*	0.0465*	0.0453*
	(0.028)	(0.028)	(0.027)	(0.027)
No secondary	-0.0109	-0.0106	-0.0100	-0.0094
	(0.011)	(0.012)	(0.012)	(0.011)
R-squared	0.03	0.04	0.04	0.04
Additional controls:				
muni. infra, m. earnings $^{a}(t_{-1})$	no	yes	yes	yes
age, marital status	no	no	yes	yes
no. children	no	no	no	yes

ENDESA 1998, 2006/07 and 2011/12 data. Note that the DHS 1998 did not include these questions. OLS estimation. All specifications include municipal fixed effects and year dummies. Sample includes women aged 15-49 with partners. ^{a} One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded.

Table 9: Export processing zones, anthropometry scores and partner's socioeconomic characteristics, Nicaragua 1998-2012

	(1)	(2)	(3)	(4)
PANEL A: Woman's height (cm)				
EPZ*no secondary	-0.1460	-0.2132	-0.1913	-0.1795
	(0.231)	(0.231)	(0.232)	(0.225)
EPZ	0.2207	0.4019	0.4029	0.4107
	(0.234)	(0.301)	(0.301)	(0.308)
No secondary	-0.9687***	-0.9191***	-0.9099***	-0.7576***
	(0.121)	(0.123)	(0.122)	(0.117)
N.obs	24359	23367	23367	23367
R-squared	0.07	0.07	0.07	0.07
PANEL B: Partner has no secondary education				
EPZ*no secondary	0.0155	0.0206	0.0180	0.0182
	(0.029)	(0.030)	(0.030)	(0.028)
EPZ	-0.0396	-0.0706*	-0.0714*	-0.0740**
	(0.032)	(0.038)	(0.039)	(0.037)
No secondary	0.3365***	0.3335***	0.3313***	0.3121***
	(0.011)	(0.012)	(0.012)	(0.010)
N.obs	21964	20982	20982	20982
R-squared	0.21	0.21	0.21	0.22
PANEL C: Woman's weight (kg)				
EPZ*no secondary	1.5088***	1.5260***	1.0513**	1.0683**
	(0.497)	(0.508)	(0.495)	(0.495)
EPZ	-0.4455	-0.2844	-0.2725	-0.2590
	(0.508)	(0.586)	(0.535)	(0.528)
No secondary	-0.7533***	-0.7756***	-0.9286***	-0.6911***
	(0.212)	(0.222)	(0.215)	(0.210)
N.obs	23958	22977	22977	22977
R-squared	0.08	0.08	0.13	0.14
Additional controls:				
muni. infra, m. earnings $^{a}(t_{-1})$	no	yes	yes	yes
age, marital status	no	no	yes	yes
no. children	no	no	no	yes

ENDESA 1998, 2006/07 and 2011/12 data. OLS estimation. All specifications include municipal fixed effects and year dummies. Sample includes women aged 15-49 with partners. ^{a} One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded.

Table 10: Low-skilled, salaried non-agricultural employment and socio-economic conditions, by women's educational attainment

				Partners			Infrastructure		
PANEL A: Women without secondary education	**age**	**any primary ed.**	**total ch. born**	**Partner emp-loyed**	**Age partner**	**Partner any sec ed**	**Hhld elec.**	**Hhld dirt floor**	**Hhld piped water**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A1: No low-skilled salaried work									
	30.8427	0.0000	3.4583	0.8736	35.8298	0.2309	0.5744	0.5598	0.4748
	(0.087)	(0.000)	(0.025)	(0.003)	(0.109)	(0.004)	(0.004)	(0.002)	(0.004)
No.obs.	10354	10354	10354	9554	9332	9156	6892	6892	6892
A2: Low-skilled salaried work (non-agricultural)									
	34.5210	0.8887	3.5756	0.7680	38.7716	0.3173	0.7165	0.4996	0.6169
	(0.142)	(0.005)	(0.038)	(0.008)	(0.202)	(0.009)	(0.006)	(0.004)	(0.006)
No.obs.	3370	3370	3370	3109	2603	2731	1959	1959	1959
Difference (A2-A1)									
	3.6782***	0.0540***	0.1174**	-0.1056***	2.9418***	0.0864***	0.1421***	-0.0603***	0.1421***
	(0.168)	(0.007)	(0.048)	(0.007)	(0.226)	(0.009)	(0.007)	(0.005)	(0.007)
No.obs.	13724	13724	13724	12663	11935	11887	8851	8851	8851
PANEL B: Women with some secondary education				Partners			Infrastructure		
	age	**finished secondary ed.**	**total ch. born**	**Partner emp-loyed**	**Age partner**	**Partner any sec ed**	**Hhld elec.**	**Hhld dirt floor**	**Hhld piped water**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
B1: No low-skilled salaried work									
	30.9198	0.0001	2.4685	0.8361	35.1899	0.6457	0.6706	0.4916	0.5515
	(0.090)	(0.000)	(0.021)	(0.004)	(0.118)	(0.006)	(0.005)	(0.003)	(0.005)
No.obs.	8767	8767	8767	8391	7620	7415	4458	4458	4458
B2: Low-skilled salaried work (non-agricultural)									
	32.5389	0.5221	2.4773	0.7417	36.0827	0.6614	0.7786	0.4501	0.6655
	(0.137)	(0.009)	(0.030)	(0.008)	(0.191)	(0.009)	(0.006)	(0.005)	(0.007)
No.obs.	3428	3428	3428	3295	2682	2689	1486	1486	1486
Difference (B2-B1)									
	1.6191***	-0.1439***	0.0088	-0.0944***	0.8928***	0.0158	0.1080***	-0.0414***	0.1140***
	(0.167)	(0.010)	(0.038)	(0.008)	(0.228)	(0.011)	(0.009)	(0.006)	(0.009)
No.obs.	12195	12195	12195	11686	10302	10104	5944	5944	5944

DHS and ENDESA 1998, 2006/7 and 2011/12 data. Respondents with primary education or less. [a] Samples include women aged 15-49 who are married or have a partner. The municipality of Managua is excluded. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Data Appendix A: Components of the repeated cross-sections

Nationally-representative data on non-cooperative behaviour within the household was merged from three sources to create a pseudo-panel at the municipal level. The three surveys employed in the main analyses comprise: Nicaragua Demographic and Health Survey (DHS) 1997-1998, the 2006-7 Reproductive Health Survey (ENDESA) and the 2011-12 Survey of Nicaraguan Demography and Health (ENDESA). The 1998 DHS survey includes 14 800 women between 15-49 years of age. In the 2006-7 Reproductive Health Survey about 14 000 women answered the questionnaire. The final sample for the ENDESA 2011-12 survey comprised 15 266 women. Questions about partners' violence, threats, controlling behaviour and alcohol consumption were identical across surveys.

A men's survey was also undertaken, and comprised similar questions about gender norms. The number of respondents was far less in all cases, and did not correspond in many cases to the partners of women interviewed. For this reason, effects of women's EPZ employment on their partner's views cannot be readily assessed.

The information on municipal labour markets from the available nationally-representative household surveys was merged with the DHS or ENDESA survey from the closest corresponding year. Earnings, labour supply and occupation information was obtained from the large nationally-representative household surveys undertaken by the Nicaragua National Statistical Agency and World Bank from 1993. The 1993 Living Standards Monitoring Study (LSMS/EMNV) comprises 4454 households and 25 162 respondents. The 1998 LSMS/EMNV included 4 087 households and 23 208 individuals. The 2005 LSMS/EMNV comprised 7 834 households. Data from the the 1993, 1998 and 2005 LSMS/EMNV household surveys were used to create year-specific measures of labour market and infrastructure variables. These comprise: Mean men's and women's earnings in a municipality, and fractions of households with electricity, piped water, improved sanitation and dirt floors. These lagged time-varying municipal means form the lagged variables included in the preferred multivariate specifications.

The timing of these surveys is displayed in graph format in Figure 3.

Summary statistics of socio-economic outcomes

The socioeconomic characteristics of those employed in low-skilled, salaried employment outside of agriculture differ from those without such work. A comparison of these means

is presented in Panel A of Table 10. Respondents engaged in such employment are somewhat older (column (1)), more likely to have completed primary education (column (2)), and have more children (column (3)). Their partners are less likely to be employed (column (4)), are older (column (5)), and are more likely to have completed some secondary schooling (column (6)). These women are much more likely to reside in households with electricity (0.57, versus 0.72, column (7)), with non-dirt floors and with piped water (columns (8) and (9)). These differences are suggestive of selectivity into non-agricultural employment amongst this least-educated group of women. Similar patterns prevail for women with some secondary education (Panel B).

1993 LSMS/EMNV Summary statistics

Simple means are suggestive of pre-existing differences in levels of infrastructure provisions between municipalities which would and would not receive an export processing zone during 1998-2012. In Table 11 household infrastructure means for 1993 are compared. Masaya and Managua municipalities are excluded. Those which would eventually host an EPZ had greater electricity and piped water provisions (columns (1) and (2)), more access to telephones (column (4)), and were far less likely to be rural (column (5)). Consistent with greater access to electricity, radio, television and refrigerator provisions were already greater in 1993 in locations which would later obtain EPZs (columns (6)-(8)). Houses in future EPZ locations were also far less likely to have had dirt floors in 1993 (column (9)).

Municipal infrastructure provisions may impact the relative standing of women in households because home production is strongly governed by gender roles. Home production may be altered by household infrastructure provisions such as electricity and water. Koenig, Ahmed, Hossain, and Mozumder (2003) find that community-specific characteristics are important correlates of violence in households in Bangladesh.

The differences in these means for 1993 may demonstrate the importance of controlling for fixed effects at the municipality level in the main estimation. The existence of the 1993 data also permits creation of lagged values of infrastructure provisions and male and female earnings, which can be employed to account for potential endogeneity in the timing of EPZ arrival.

Table 11: Future export processing zones and infrastructure provisions of households in 1993

	hhld elec	**piped water**	**Improved sani.**	**phone (land)**	**rural**	**radio**	**tele-vision**	**refrig erator**	**dirt floor**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A1: EPZ in municipality 1998-12									
	0.8179	0.7948	0.6806	0.0694	0.2577	0.7654	0.6219	0.2577	0.3688
	(0.047)	(0.033)	(0.066)	(0.023)	(0.074)	(0.035)	(0.042)	(0.026)	(0.066)
N.obs	648	648	648	648	648	648	648	648	648
Panel A2: No EPZ in municipality 1998-12									
	0.4961	0.4048	0.8866	0.0176	0.6034	0.6412	0.3004	0.1306	0.5668
	(0.035)	(0.039)	(0.026)	(0.005)	(0.040)	(0.019)	(0.032)	(0.015)	(0.032)
N.obs	2673	2673	2673	2673	2673	2673	2673	2673	2673
Diffference in means (A1-A2)									
EPZ 98-12	0.3218***	0.3900***	-0.2061***	0.0519**	-0.3457***	0.1242***	0.3215***	0.1272***	-0.1980***
	(0.057)	(0.050)	(0.068)	(0.023)	(0.081)	(0.038)	(0.051)	(0.029)	(0.070)
N.obs	3321	3321	3321	3321	3321	3321	3321	3321	3321

LSMS/EMNV 1993 data. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipality level. Residents of the municipalities of Masaya and Managua are excluded.

Data Appendix B: IV estimation for women's anthropometric and partner outcomes

The anthropometric and partners' socioeconomic status results are very similar using IV rather than DDD estimation. These are shown in Table 9. In all cases, the preferred specification (column (8)) is of the same sign and statistical significance as those reported in the main text.

Table 12: Low-skilled, salaried non-agricultural employment and other outcomes

	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Woman's height (cm)								
low-skilled, salaried work	0.0487	-2.0174	0.0429	-2.8043	0.0516	-1.8598	0.0408	-2.5037
	(0.113)	(3.087)	(0.114)	(2.930)	(0.114)	(3.292)	(0.112)	(3.038)
N.obs	24359	24359	23367	23367	24359	24359	23367	23367
R-squared	0.06	-0.02	0.06	-0.04	0.06	-0.01	0.07	-0.02
PANEL B: Partner has no secondary education								
low-skilled, salaried work	-0.0032	0.2265	-0.0041	0.2851	-0.0087	0.2186	-0.0076	0.2822
	(0.011)	(0.424)	(0.011)	(0.414)	(0.011)	(0.470)	(0.011)	(0.442)
N.obs	21964	21964	20982	20982	21964	21964	20982	20982
R-squared	0.11	0.11	0.11	0.08	0.11	0.11	0.14	0.10
PANEL C: Woman's weight (kg)								
low-skilled, salaried work	1.9234***	22.1653***	1.8991***	21.4173***	1.3154***	16.7432**	1.2986***	15.8013**
	(0.209)	(8.214)	(0.205)	(7.943)	(0.204)	(8.123)	(0.202)	(7.920)
N.obs	23958	23958	22977	22977	23958	23958	22977	22977
R-squared	0.08	-0.53	0.08	-0.49	0.13	-0.23	0.14	-0.19
Additional controls:								
muni. infra, m. earnings [a](t_{-1})	no	no	yes	yes	yes	yes	yes	yes
age, marital status	no	no	no	no	yes	yes	yes	yes
no. children	no	no	no	no	no	no	yes	yes

ENDESA 1998, 2006/07 and 2011/12 data. Note that DHS 1998 data does not include these questions. Sample includes women aged 15-49 with partners, with and without secondary schooling. All specifications include municipal fixed effects and year dummies. [a] One-period lagged year-specific municipal means: electricity, piped water, sanitation and dirt floors; monthly earnings of men and women aged 15-49, respectively. These are municipal means calculated from LSMS and EMNV surveys. Sample weights are employed. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors are clustered at the municipalityXyear level. Residents of the municipality of Managua are excluded. [b] Controlling behaviour comprises: Accuses of infidelity, jealous if talks to another man, needs to know whereabouts at all times, prohibits visiting friends, restricts access to family and needs permission for medical visits. Sample weights are employed. Residents of the municipality of Managua are excluded.

IPUMS labour market data

The observed rise in non-agricultural employment of less-educated women differs from what might be expected with economic growth in the poorest contexts. There is historical evidence that as modernisation takes place, women's employment is U-shaped, with an initial decline followed by an increase (Goldin (1994)). Such an initial decline does not yet appear to have taken place in Nicaragua. A potential reason is that men's wages have not yet risen enough for negative household wealth effects on women's labour supply to become important. Another is that much of recent economic growth has been concentrated in work which tends to employ women, such as EPZs.

The most recent Integrated Public Use Microdata Series (IPUMS) samples concur with the combined DHS/ENDESA surveys in showing that less-educated women's employment increased substantially between 1995 and 2005, coincident with the expansion of EPZs across western municipalities (Minnesota Population Center (2009)). In the IPUMS data, many municipalities are not individually distinguished, because they contain fewer than 20 000 residents. There are 151 municipalities in Nicaragua, but 68 municipal groupings in the IPUMS. In Figure 4, changes in non-agricultural employment levels of women without secondary education are mapped, by municipality. These changes in employment do appear to be concentrated in western municipalities of Nicaragua. Mean non-agricultural employment rates of women without secondary education rose somewhat, from 0.16 to 0.20, during 1995-2005.

The IPUMS census samples also permit assessment of how relative employment rates of women and men evolved from the last pre-revolutionary census undertaken in 1971. The relative employment rates may be important determinants of women's bargaining power in households. Following the 1971 census, Nicaragua was convulsed first by a massive earthquake which destroyed much of Managua City, and then by civil war and the 1979 Sandinista revolution. The overthrow of the Somoza regime led to new education, health and literacy programmes (Arnove (1981), Halperin and Garfield (1982)).

Relative employment of women increased across all municipalities during 1971-2005, but there was substantial geographic heterogeneity. This is shown in Figure 5. In western municipalities closer to Managua and to the Pacific coast, the increase in relative employment rates of women was large. These are the municipalities in which EPZs are concentrated. In contrast, little change in the relative employment rates of women occurred in

the remote tropical municipalities of the two autonomous regions of the Atlantic coast.

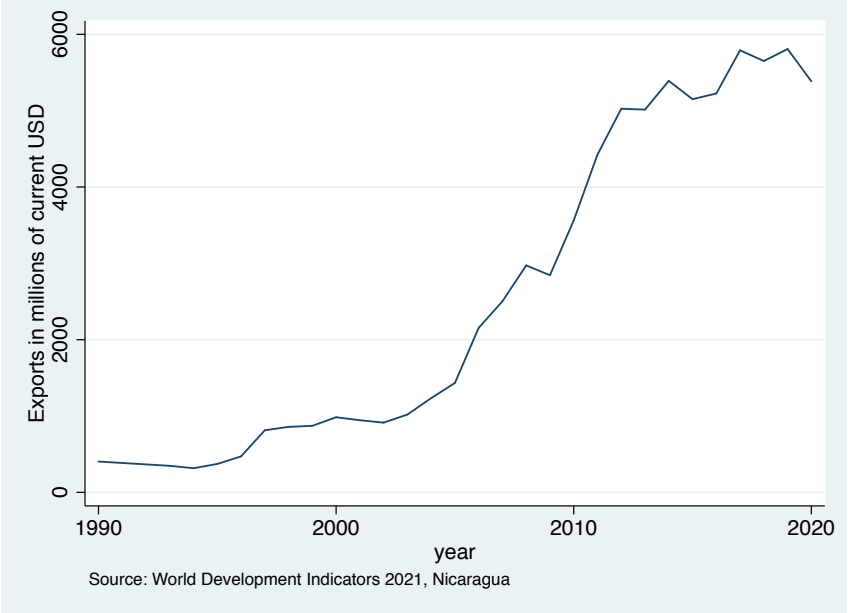

Figure 1: Exports of goods, services and income from Nicaragua, 1990-2020

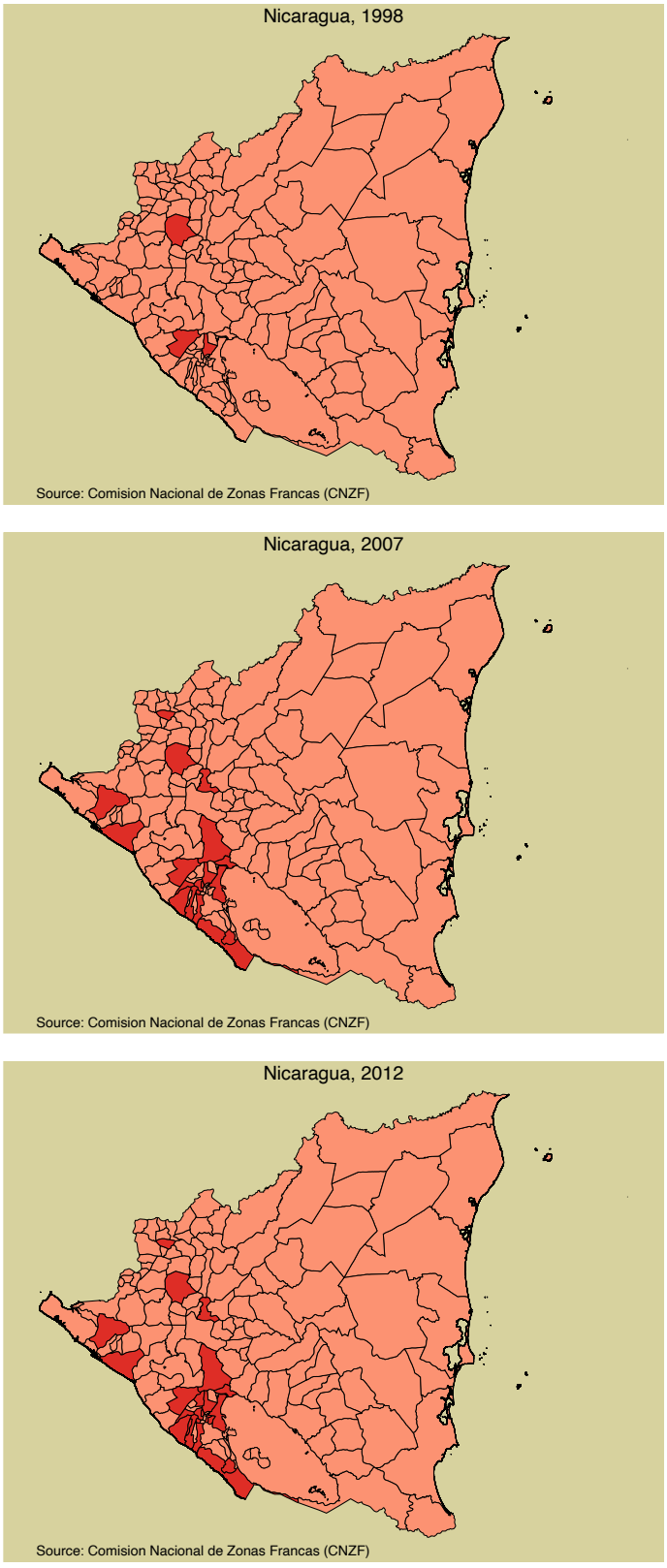

Figure 2: Municipalities with export processing zones

Figure 3: Start dates of nationally-representative surveys of Nicaragua employed in analysis

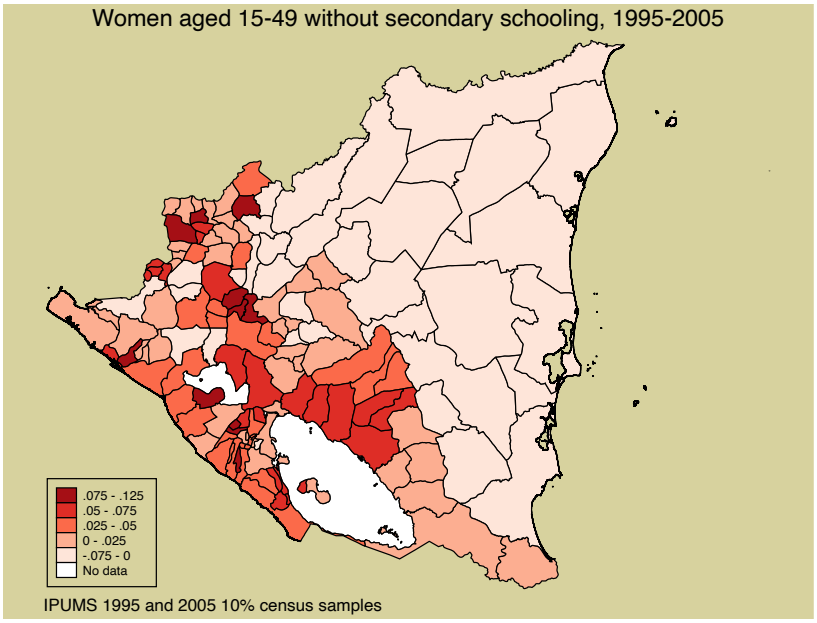

Figure 4: Change in non-agricultural employment

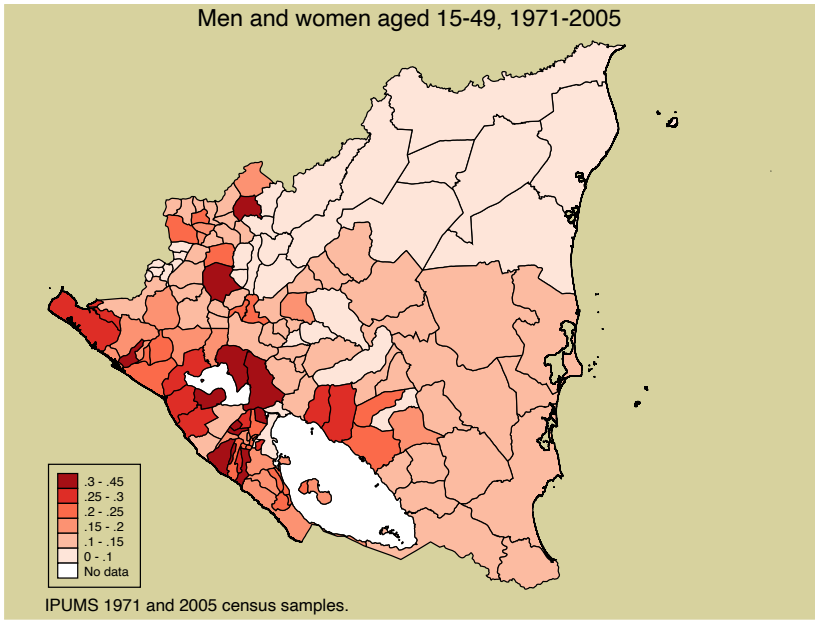

Figure 5: Change in relative employment rates, $\Delta \frac{EMP_{women}}{EMP_{men}}$

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