

# Female Officers and the Discovery of Domestic Violence

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### Abstract

Domestic violence (DV) is a crime that usually has female victims and is often under-reported. This paper studies the effect of having a female officer dispatched in the primary unit on the discovery of DV in physical abuse incidents in Milwaukee and Chicago. Using three-year calls for service data and conditional random assignment of officers in the dispatch process, the paper finds that the existence of a female officer in the primary unit scales up the likelihood of discovering DV in physical abuse incidents by 10% in Milwaukee. Analysis of data from Chicago indicates a similar effect. These results indicate that female officers play an important role in discovering DV.

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# 1 Introduction

Domestic violence (DV) is a common yet under-reported gender-based crime. In DV incidents, victims are largely female and offenders are largely male. One of the most apparent forms of DV is physical abuse (United Nations, n.d.). There are approximately 2.5 to 4.5 million physical abuse incidents against women in the US each year (Rand & Rennison, 2005). DV has different interpretations. It is interpreted to be a way for a man to dominate his partner (Dobash & Dobash, 1979), to provide positive utility to some men (Tauchen et al., 1991; Aizer, 2010), and to be an unintentional outcome when an argument becomes out of control (Straus et al., 1980; Johnson, 2009). DV has adverse health outcomes in women's health systems that include the brain system, cardiovascular system, gastrointestinal system, immune and endocrine system, musculoskeletal system, and reproductive system (Black, 2011). Besides, DV has psychological impacts that parallel with the trauma of being taken hostage and subjected to torture (Dutton, 2000; Herman, 2015). Also, DV has intergenerational effects that are transmitted from parents to children (Pollak, 2004).

Despite its severe health outcomes, psychological impacts, and intergenerational effects, DV frequently remains under-reported. By summarizing data from the National Crime Victimization Survey (NCVS), Reaves (2017) finds that nearly 50% of DV incidents remain unreported. Reasons for not reporting these incidents include social stigma (Devries et al., 2011), distrust of the institution (Belknap, 2010), fear of retaliation (Kishor & Johnson, 2005), lack of awareness (Casey et al., 2011), and financial barriers (Wolf et al., 2003). Under-reporting has detrimental consequences from various perspectives. It perpetuates such incidents and causes extended sufferings for victims. It also limits people's understanding of the actual magnitude of these incidents, which makes developing effective mitigation strategies difficult (Sahay, 2021).

Although under-reporting DV has detrimental consequences from various perspectives, the question of how to respond to incidents so that more DV can be discovered and reported

remains mostly unsolved. One potential solution is to have female officers respond to physical abuse incidents in order to discover more DV incidents. As mentioned earlier, most victims of DV are female and physical abuse is one of the most apparent forms of DV. Given that female officers often express more empathy (Rabe-Hemp, 2008) and victims find female officers more favorable in these incidents (Harrington et al., 2003), it is plausible that officers' gender may play a role in discovering DV related physical abuse.

This paper provides the first empirical evidence on the effect of dispatching female officers on discovering DV related physical abuse incidents using 911 calls for service data. A call for service is a primary way in which the public can solicit the assistance of police. However, the classification of the call may be inaccurate because of ambiguous information from callers and time pressure in the classification process (Simpson & Orosco, 2021). Therefore, it is likely that officers on the scene discover DV elements in physical abuse incidents and then reclassify the calls. Given that DV victims are predominantly female, female officers might be important for discovering these incidents.

This paper uses the calls for service data merged with officer characteristics data from the Milwaukee and Chicago Police Departments to study the effect of having a female officer dispatched in the primary unit on discovering DV related physical abuse incidents. The two cities are very different in sizes, populations, and police demographics. Both police departments provided three years of data from 2017 to 2019. In both police departments, there is a telecommunicator or call taker who picks up a 911 call, and a dispatcher who assigns available officers to the call. Calls are dispatched based on priority. This dispatch process indicates that the variation in whether there exists a female officer in the primary unit is as good as random conditional on district and time fixed effects. This conditional random assignment of officers in the police dispatch process overcomes issues arisen when there is nonrandom officer selection into situations (Hoekstra & Sloan, 2022).

Results indicate that the existence of a female officer in the primary unit improves the discovery of DV in physical abuse incidents by 10% in the Milwaukee Police Department. A

positive effect is also found by analyzing data from the Chicago Police Department. Results show that the existence of a female officer in the primary unit scales up the discovery of DV in physical abuse incidents by 13%. These results support the notion that the empathy of female officers (Rabe-Hemp, 2008), along with victims' preferences for female officers (Harrington et al., 2003), play a significant role in the enhanced discovery of DV in physical abuse incidents.

The paper explores two dimensions of heterogeneity. First, it considers heterogeneous effects by the timing of shifts. Results indicate that the significant increase in the probability of discovering DV related physical abuse when a female officer is present in the primary unit is mostly contributed by those working in the shift from 4 pm-midnight in the Milwaukee Police Department, and it is largely contributed by those working in the shift from 8 am-4 pm in the Chicago Police Department. Second, it considers heterogeneity effects of having a more or less experienced female officer in the primary unit. Results from both police departments indicate that the significant increase in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit is mostly contributed by those with at least 10 years of experience.

This paper makes contributions to the economics of crime literature on DV by directly providing quantitative evidence of the effect of gender roles on the novel outcome of discovering DV related physical abuse incidents. Previous literature has studied the effects of arrests (Iyengar, 2009; Amaral et al., 2023), prosecution (Aizer & Dal Bo, 2009), unilateral divorce laws (Dee, 2003; Stevenson & Wolfers, 2006), gender wage gap (Aizer, 2010), unemployment (Van der Berg & Tertilt, 2012), upset losses in football games (Card & Dahl, 2011), rainfall shocks (Sekhri & Storeygard, 2014), and female representation among officers in an area (Miller & Segal, 2019) on DV incidents. Specifically, Miller & Segal (2019) analyze data from the NCVS and Uniform Crime Reporting (UCR) program using OLS and IV approaches. Using responses to the questions on crime incidents and whether these incidents are reported to the police, the authors conclude that increasing female representation among

officers in an area through affirmative action plans increases reports of DV. Using homicide data from the UCR program, they find a negative relationship between the previous year's female share of officers in the county and the current year's intimate partner homicide rates. The data from NCVS and UCR program do not allow the authors to observe how people in the area know there are more female officers and how these police-civilian interactions take place. This paper fills in the gap by directly estimating the effect of female officers in calls for service. A key advantage of using calls for service data is that the existence of a female officer in the primary unit is conditionally random. This empirical strategy avoids problems generated by endogenous police-civilian interactions. The idea of using a different approach to solve this endogeneity issue is related to works by West (2018) who utilizes conditional random assignment of officers to traffic accidents to study racial bias in traffic citations, Weisburst (2022) who uses 911 call data to assess the individual police officers' value added, and Hoekstra & Sloan (2022) who use 911 call data to examine race and police use of force.

This paper also contributes to the literature that studies the effects of police staffing and policies. Previous literature has focused on the size of police forces (Levitt, 1997; Chalfin & McCrary, 2013), the adoption of information technology (Garicano & Heaton, 2010), and the use of DNA databases (Doleac, 2017). This paper considers another aspect of police staffing by studying the effects of officers' gender. The focus on officers' gender is related to Harrington et al. (2003) who use survey data to describe advantages of hiring women in law enforcement agencies. Using survey data does not allow the authors to establish causal inferences on the effects of gender and it has issues with sampling error. This paper deals with sampling issues and estimates causal effects of female officers by using calls for service data. Moreover, the focus on officers' gender in this paper is broadly related to the literature on police demographics. Previously, studies have related officer race to arrests (Donohue III & Levitt, 2001), search (Antonovics & Knight, 2009), and use of force (Fryer Jr, 2019; Hoekstra & Sloan, 2022). The difference between this paper and that literature is that

this paper considers the role of gender in interactions between police and victims while that literature mainly considers interactions between police and suspected offenders.

Furthermore, this paper contributes to the literature that studies the effects of female representation. The finding of an increased discovery of DV related physical abuse with female officer dispatched in this paper highlights the importance of female officers in the police force, a field traditionally dominated by male officers. As a result, this paper is related to studies on the effects of female representation. Previously, Chattopadhyay & Duflo (2004) point out that women leaders in local government invest more in the public goods that are more closely linked to women's concerns. Iyer et al. (2012) find that an increase in female representation in local government increases reports of crimes against women. Matsa & Miller (2011) show that female representation on corporate boards influences the gender composition of the top management in companies. Matsa & Miller (2013) and Miller (2018) focus on the effects of gender quotas for corporate board seats on corporate decisions and find that there are fewer workforce reductions in these corporations. I'm unaware of any studies that examine the effects of female representation in primary units for calls for service on discovering DV incidents.

Results in this paper have policy implications for policing in the US. There have been controversies on the integration of female officers (Martin & Jurik, 2006). Opponents believe that since women are generally smaller and weaker than men, they are less capable at policing. They are concerned that there may also be lower standards for female officers in the hiring process, which lowers average officer quality (Miller & Segal, 2019). Contrary to these views, this paper provides evidence on the vital role that female officers play. Although there are only two cities in the analysis, results in this paper imply that DV can be under-reported when male officers are the only ones dispatched in the primary unit. The existence of a female officer in the primary unit is important for discovering DV in physical abuse incidents. Hence, female officers are an indispensable part in the police force.

The rest of the paper proceeds as follows. Section 2 discusses the research design. Section

3 presents empirical analysis. Section 4 concludes.

## 2 Research Design

To obtain the data needed in this paper, I sent Freedom of Information Act (FOIA) requests to police departments in the top twenty cities in terms of homicide rate in the US.<sup>1</sup> Homicide is one of the most serious violent crimes. Cities ranked in the top in terms of homicide rate are more likely to incur other violent crimes such as physical abuse. These physical abuse incidents are the focus of this paper. Moreover, cities with higher violent crime rates are more likely to maintain database to record crimes in order to analyze crime patterns and better serve the community. Table A1 lists the twenty police departments that I sent FOIA requests to.

For the dataset in this paper, I need to be able to observe and link the gender of the police officer to 911 calls. Among the twenty police departments with FOIA requests sent, two did not respond. Twelve responded but did not provide the calls for service data. Four provided the calls for service data without information on officers dispatched to the call. Only the Milwaukee Police Department and Chicago Police Department provided the calls for service data and officer characteristics data that can be linked together from 2017-2019. This section separately introduces the research design using data from the two police departments.

### 2.1 Milwaukee Police Department

This paper uses 911 calls for service data and officer characteristics data from the Milwaukee Police Department. Milwaukee is the largest city in the state of Wisconsin with a population of about 570,000. There are seven police districts in this city. Like other law enforcement agencies in the US, it uses the computer aided dispatch system to record the call information such as type of incident, officer assigned, dispatch time, as well as information on officer

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<sup>1</sup>The ranking of the homicide rate of cities in the US comes from [https://en.wikipedia.org/wiki/List\\_of\\_United\\_States\\_cities\\_by\\_crime\\_rate](https://en.wikipedia.org/wiki/List_of_United_States_cities_by_crime_rate).

availability. When a civilian calls 911, the first available telecommunicator takes the call. A telecommunicator's responsibility includes ascertaining incident information, establishing incident priority, and forwarding the incident for dispatch (National 911 Program, 2022). After the telecommunicator assigns the call to the appropriate district dispatcher, the dispatcher assigns available officers in the shift to the call based on call priority. I emailed officers in the police department and they confirmed that calls are dispatched based on priority.

The calls for service data provided by the Milwaukee Police Department contains information on call created time and date, call dispatch time and date, original and final call type, officer dispatched, primary unit dispatched, and police district from 2017 to 2019. The primary unit is generally the first unit to arrive on the scene. The time between call and dispatch represents call priority, since higher ranked calls are at the top of the dispatch queue. The officer characteristics data provided by the Milwaukee Police Department has information on officer race, gender, and date that the officer was first appointed at the police department. The officer characteristics data is linked to the calls for service data to observe dispatched officers and their characteristics for each of the call.

DV related physical abuse is any type of physical force against the intimate partner that causes injury or puts the person's health in danger (Office on Women's Health, 2021). Most police intervention of these incidents starts from emergency calls (HM Inspectorate of Constabulary, 2014). In this police department, there are nine call types that fall under DV related physical abuse. These calls have the suffix "DV" to differentiate themselves from others. For example, the police department records "battery cutting" and "battery cutting-DV" separately. Table 1 presents call types that belong to DV related physical abuse and their corresponding ones without the "DV" suffix. Calls with call types in the second column of Table 1 receive speedy response. On average, officers are dispatched within 10 minutes for these calls. Also, observation of the data indicates that the final call type can be different from the original call type. About 50% of calls that are reclassified as DV related physical abuse come from call types related to physical abuse only. This implies that



there are ambiguities in the original call type classification, as officers on the scene know more details about incidents than dispatchers who often have limited information.

To study whether female officers are more likely to discover DV related physical abuse on the scene, the sample is restricted to call types related to physical abuse only as listed in the second column of Table 1. Roughly 28% of the calls have one officer dispatched and roughly 71% of the calls have two officers dispatched in the primary unit in the sample. Characteristics of the officer with more years of experience in the primary unit are important, as less experienced officers often learn from more experienced ones. This echoes the accumulation of human capital with more knowledgeable coworkers (Herkenhoff et al., 2018). These officers with more years of experience in primary units are very familiar with the districts that they work at. Similar to Hoekstra & Sloan (2022), the analysis uses home district to proxy the district to which the officer responds to the most calls. To be more precise, it calculates the home districts for officers each month. By conducting a comparison of officers' home districts across months, results reveal that there is an 85% chance that these officers remain assigned to their home districts. This pattern corresponds to the community policing philosophy, which emphasizes long-term assignment of officers to specific areas in order to increase trust in police and improve community partnerships (U.S. Department of Justice, 2014).

Table 2 presents summary statistics for incidents in the sample. The time between call and dispatch is about 9 minutes on average. There is a 95% chance that the call is from the home district of the officer with more years of experience in the primary unit. About 21% of the primary units have female officers. Roughly 64% of the officers with more years of experience in primary units are white. On average, more experienced officers in primary units have worked for about 11 years.

The way that the dispatch process works in calls for service leads to conditional random assignment. As mentioned earlier, a civilian's 911 call is picked up by the first available telecommunicator, and the telecommunicator assigns the call to the appropriate district dispatcher to dispatch the call. The telecommunicator gathers information about the emergency

(National 911 Program, 2022) and the dispatcher assigns officers based on call priority. The dispatcher does not have direct contact with the caller and only has limited information from the telecommunicators, which rules out that the dispatcher has extra information on specific needs of the caller (Amaral et al., 2023). Moreover, calls in the sample receive speedy response. Table 2 indicates that officers are dispatched in about 9 minutes on average to these calls. The way that the dispatch process works implies that conditional on district and time fixed effects, the variation in whether there exists a female officer in the primary unit is as good as random. As a result, the regression controls for district-by-year fixed effects in the baseline regression, and district-by-year-by-week-by-shift fixed effects in the preferred specification.<sup>2</sup>

To assess the validity of the design, the paper directly examines the correlation between call characteristics and whether there exists a female officer in the primary unit. Specifically, the assessment separately regresses time between call entry and call dispatch, and whether the call is from the home district of the officer with more years of experience in the primary unit on the existence of a female officer in the primary unit with district-by-year fixed effects and district-by-year-by-week-by-shift fixed effects. Since calls with higher priority are at the top of the dispatch queue, the first assessment checks whether primary units with female officers are dispatched to more or less urgent incidents. Column (1) of Table 3 controls for district-by-year fixed effects. Column (2) of Table 3 controls for district-by-year-by-week-by-shift fixed effects. Results in the table indicate there is no statistical significance for the coefficients. This is consistent with the identifying assumption in this paper. The second assessment checks whether primary units with female officers are dispatched to districts where officers with more years of experience respond to the most calls. Results from both columns of Table 4 show there is no statistical significance for the coefficients. This is also consistent with the identifying assumption in this paper.

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<sup>2</sup>Shifts are staggered in Milwaukee. In district-by-year-by-week-by-shift fixed effects, shifts are defined as 8 am-4 pm, 4 pm-midnight, and midnight-8 am. Hoekstra & Sloan (2022) also define shifts in these three time periods.

## 2.2 Chicago Police Department

The paper also studies the effect of having a female officer dispatched in the primary unit on the discovery of DV related physical abuse in Chicago. Chicago is the largest city in the state of Illinois and the third most populous city in the US. Its population is around 2.75 million. There are twenty-two police districts in the city. In this police department, call takers pick up 911 calls. Call takers gather information about the emergency and input it into the police computer aided dispatch system (Neusteter et al., 2019). According to the General Order G03-01-01 in the directive of the Chicago Police Department, the system automatically prioritizes each event, and then dispatchers assign available officers to the call based on call priority.

The paper uses events data and responding officers data provided by the Chicago Police Department from 2017-2019. The two datasets are merged together to observe information on call received date and time, call dispatched date and time, original and final dispatch description, officer dispatched, primary unit dispatched, and police district. The call type that falls under DV related physical abuse is domestic battery. About 95% of these incidents are reported through 911 calls. According to the Incident Reporting Guide in the Chicago Police Department, domestic battery is defined as bodily harm or physical contact from family members which may contain the use of dangerous weapons such as firearms or cutting instruments. The corresponding physical abuse incidents without DV elements are classified as battery related. Table 8 presents the call type that belongs to DV related physical abuse and the corresponding ones without DV elements at the Chicago Police Department.

To study whether having a female officer in the primary unit increases the probability of discovering DV related physical abuse incidents on the scene, the sample is also restricted to call types related to physical abuse only as listed in the second column of Table 8. Roughly 33% of these incidents have one officer in the primary unit and about 57% of these incidents have two officers in the primary unit. These incidents receive speedy response. The time

between call and dispatch is about 5 minutes on average. There is a 97% chance that the call is from the home district that the more experienced officer in the primary unit responds to the most calls. The probability that there exists a female officer in the primary unit is around 32%. About 42% of the officers with more years of experience in primary units are white. On average, more experienced officers in primary units have worked for roughly 11 years. Table 9 presents summary statistics. Similar to the Milwaukee Police Department, the officers with more years of experience in primary units in the Chicago Police Department are also very familiar with the districts they are assigned to. Through a comparison of officers' home districts across months, results imply that there is an 86% chance that these officers remain assigned to their home districts.

The dispatch process described earlier at the Chicago Police Department also implies that conditional on district and time fixed effects, the variation in whether there exists a female officer in the primary unit is as good as random. To assess the validity of the design, the assessment separately regresses the time between call entry and call dispatch, as well as whether the call is from the home district of the officer with more years of experience in the primary unit, on the existence of a female officer in the primary unit with district-by-year-by-month-by-week-by-time fixed effects. Results from the regression with district-by-year fixed effects and the regression with district-by-year-by-week-by shift fixed effects in Table 10 indicate that there is no statistical significance for the coefficient in the first regression. The significant coefficients reported in Table 11 imply that primary units with female officers are roughly 0.3 percentage points less likely to be dispatched to calls from the home district of the officer with more years of experience in the primary unit. Given that 97% of the calls come from the home district of the officer with more years of experience in the primary unit, a deviation of 0.3 percentage points is negligible. The economic significance is very small. The lack of statistical significance of coefficients in Table 10 and the lack of economic significance of coefficients in Table 11 are consistent with the identifying assumption in the paper. Hoekstra & Sloan (2022) also have similar issues and use this argument to justify the

identifying assumption.

## 3 Empirical Analysis

### 3.1 Regression Model

The empirical analysis uses the regression below to estimate the effect of having a female officer in the primary unit on the probability of discovering DV related physical abuse. As discussed in the previous section, the identifying assumption is that conditional on district and time fixed effects, the variation in whether there exists a female officer in the primary unit is as good as random. The regression model incorporates the identifying assumption in the following equation:

$$Discover_{dct} = \beta_0 + \beta_1 I(\text{Female officer in primary unit})_{dct} + \theta_{dt} + \gamma X_c + \varepsilon_{dct}. \quad (1)$$

$Discover_{dct}$  is a binary variable equal to one when call  $c$  from district  $d$  in time period  $t$  is classified into DV related physical abuse in the final call type.  $I(\text{Female officer in primary unit})_{dct}$  is an indicator variable that takes on a value of one if there exists a female officer in the primary unit for the call.  $\theta_{dt}$  contains district and time fixed effects. In the baseline regression, it represents the district-by-year fixed effects. In the preferred specification for results interpretation, it represents the district-by-year-by-week-by-shift fixed effects.  $X_c$  includes call controls that contain the time between call and dispatch, whether the call is from the home district of the officer with more years of experience in the primary unit, race of the officer with more years of experience in the primary unit, as well as fixed effects for the day of the week, original call type, and maximum years of experience for officers in the primary unit. An officer's home district is proxied by the district to which the officer responds to the most calls in a month. The standard error is clustered at the officer with more years of experience in the primary unit for the call for service.

## 3.2 Results for Milwaukee Police Department

### 3.2.1 Main Results

Table 5 presents results for regressions that implement equation (1). Column (1) of Table 5 shows regression results with district-by-year fixed effects. Column (2) shows regression results with district-by-year-by-week-by-shift fixed effects and call controls. Both regressions find that there is a significant increase in the probability of discovering DV in physical abuse incidents when there exists a female officer in the primary unit. Results from the preferred specification in column (2) indicate that having a female officer in the primary unit increases the probability of discovering DV related physical abuse by about 0.3 percentage points. Given that 3% of the original call types are reported as DV related physical abuse in this city, having a female officer in the primary unit is 10% more likely to discover these incidents.

For robustness check, the analysis conducts a logit regression. Due to concerns that the logit estimator can have convergence issues when there are many fixed effects in the regression (Chamberlain, 1980), the logit regression controls for district-by-year fixed effects. Table A2 reports the regression result in odds ratio. This result also implies a significant increase in the probability of discovering DV in physical abuse incidents when a female officer exists in the primary unit.

According to previous literature, two potential channels can contribute to the increased discovery of DV related physical abuse when there exists a female officer in the primary unit. First, female officers have greater empathy and better communication skills (Rabe-Hemp, 2008). They also express more concerns, patience, and understanding than male officers when dealing with violence against women (Homant & Kennedy, 1985; Harrington et al., 2003). The care and patience by female officers can be related to finding out more DV related physical abuse on the scene. Second, most victims of DV are female. They find female officers more helpful and favorable in these incidents (Harrington et al., 2003). This echoes the notion of female officers helping women (Miller & Segal, 2019) and the notion of

female role modelling in positions of authority (Athey et al., 2000; Keiser et al., 2002; Meier & Nicholson-Crotty, 2006; Carrell et al., 2010). So victims can be more willing to disclose incident details to female officers. As a result, it is reasonable that female officers are more likely to discover DV related physical abuse when they are dispatched to calls that may have ambiguity.

### 3.2.2 Heterogeneity Analysis on Timing of Shifts

This subsection considers the heterogeneity analysis of estimated effects by the timing of shifts. There is some evidence that people perform better during the day (Cho et al., 2020), so people working at night may incur sleep loss and fatigue. Therefore, this heterogeneity analysis explores which shift contributes to the significant increase in the probability of discovering DV in physical abuse incidents when there exists a female officer in the primary unit.

The regression considers the effects of having a female officer in the primary unit for incidents in each shift through further categorization:

$$\begin{aligned}
 Discover_{dct} = & \beta_0 + \beta_1 I(\text{Female officer in primary unit for incidents in midnight-8 am shift})_{dct} \\
 & + \beta_2 I(\text{Female officer in primary unit for incidents in 8 am-4 pm shift})_{dct} \\
 & + \beta_3 I(\text{Female officer in primary unit for incidents in 4 pm-midnight shift})_{dct} + \theta_{dt} + \gamma X_c + \varepsilon_{dct}.
 \end{aligned} \tag{2}$$

$I(\text{Female officer in primary unit for incidents in midnight-8 am shift})_{dct}$  is a binary variable equal to 1 if there is a female officer in the primary unit for incidents in the midnight-8 am shift.  $I(\text{Female officer in primary unit for incidents in 8 am-4 pm shift})_{dct}$  is a binary variable equal to 1 if a female officer is present in the primary unit for incidents in the 8 am-4 pm shift.  $I(\text{Female officer in primary unit for incidents in 4 pm-midnight shift})_{dct}$  is a binary variable equal to 1 when there exists a female officer in the primary unit for incidents

in the 4 pm-midnight shift.

Results from Table 6 show that compared to primary units with only male officers, there is a significant increase in the probability of the discovery of DV related physical abuse when there exists a female officer in the primary unit for incidents occurring in the shift from 4 pm-midnight. This implies that the significant increase in the probability of discovering DV related physical abuse when there is a female officer in the primary unit in the main result is largely contributed by those working in the 4 pm-midnight shift.

### 3.2.3 Heterogeneity Analysis on Officer Experience

Moreover, the empirical analysis considers the heterogeneity of estimated effects of having a more or less experienced female officer in the primary unit on the probability of discovering DV related physical abuse. This is motivated by Ba et al. (2021) who find that more experienced officers are more effective at deterring violent crime and they are less likely to use force. Then, this heterogeneity analysis explores whether having a female officer with a minimum of 10 years of experience or one with less than 10 years of experience in the primary unit contributes to the significant increase in the probability of discovering DV in physical abuse incidents.

The regression considers the effects of having a more or less experienced female officer by further categorization. The cutoff for more or less experience is at 10 years, which approximates the average work experience for the more experienced officer in the primary unit in Table 2. The regression uses the following equation:

$$Discover_{dct} = \beta_0 + \beta_1 I(\text{Female officer} \geq 10 \text{ years of experience in primary unit})_{dct} + \beta_2 I(\text{Female officer} < 10 \text{ years of experience in primary unit})_{dct} + \theta_{dt} + \gamma X_c + \varepsilon_{dct}. \quad (3)$$

$I(\text{Female Officer} \geq 10 \text{ Years of Experience in Primary Unit})_{dct}$  is an indicator variable that equals to 1 if there exists a female officer with at least 10 years of experience in the primary



unit.  $I(\text{Female Officer} < 10 \text{ Years of Experience in Primary Unit})_{dct}$  is an indicator variable that equals to 1 when there exists a female officer with less than 10 years of experience in the primary unit. For simplicity, I drop incidents that have a female officer with at least 10 years of experience in the primary unit and a female officer with less than 10 years of experience in the primary unit at the same time. These incidents constitute about 0.3% in the sample.

Results from Table 7 show that compared to primary units with male officers only, there is a significant increase in the probability of discovering DV related physical abuse incidents when there exists a female officer with at least 10 years of experience. This indicates that the significant rise in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit in the main result is mostly contributed by those with at least 10 years of experience.

### **3.3 Results for Chicago Police Department**

#### **3.3.1 Main Results**

In addition to studying the effects of the existence of a female officer in a primary unit on the probability of discovering DV related physical abuse using three-year data from Milwaukee, the paper also studies the effects using three-year data from Chicago. Compared to Milwaukee, the population in Chicago is five times larger, the land size is three times larger, and the police demographics are very different.

The empirical analysis of data from the Chicago Police Department also uses equation (1) as the regression model. Column (1) in Table 12 shows regression results with district-by-year-by-month-by-week-by-time fixed effects, and column (2) adds call controls to the regression. Results from the preferred specifications in column (2) imply that having a female officer in the primary unit enhances the probability of discovering DV related physical abuse by 0.4 percentage points. Given that approximately 3% of the calls for service are classified

as domestic battery initially in this city, having a female officer in the primary unit scales up the likelihood of discovering these incidents by 13%.

The analysis also conducts a logit regression for robustness check. Similarly, because of concerns that the logit estimator can have convergence issues with many fixed effects in the regression (Chamberlain, 1980), the logit regression controls for district-by-year fixed effects. Table A3 shows the regression result in odds ratio. This result supports the conclusion that having a female officer in the primary unit significantly increases the probability of discovering DV related physical abuse incidents in Chicago.

Although the population in Chicago is five times larger than Milwaukee, the land size of Chicago is three times larger, and the two cities have different police demographics, results from both cities indicate that having a female officer in the primary unit has positive effects on discovering DV related physical abuse. These results provide more support for the notion that female officers' empathy and communication skills (Rabe-Hemp, 2008), as well as victims' preference for female officers (Harrington et al., 2003), contributes to the increased discovery of DV in physical abuse incidents.

### **3.3.2 Heterogeneity Analysis on Timing of Shifts**

The empirical analysis also takes into account the heterogeneity of estimated effects of having a female officer in the primary unit for incidents in each shift using data from the Chicago Police Department.

Results from Table 13 show that, in comparison to primary units with solely male officers, there is a significant increase in the probability of discovering DV related physical abuse when a female officer is present in the primary unit in the 8 am-4 pm shift. These results show that the significant increase in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit in the main result is mostly contributed by those working in the 8 am-4 pm shift.

### 3.3.3 Heterogeneity Analysis on Officer Experience

Furthermore, the empirical analysis examines the heterogeneous effects of having a female officer with at least 10 years of experience or less than 10 years of experience in the primary unit on the probability of discovering DV related physical abuse using data from the Chicago Police Department. Similarly, incidents that have a female officer with at least 10 years of experience in the primary unit and a female officer with less than 10 years of experience in the primary unit at the same time are dropped. These incidents constitute about 1.6% in the sample.

Results from Table 14 indicate that, in comparison to primary units that contain solely male officers, having either a female officer with a minimum of 10 years of experience or one with less than 10 years of experience in the primary unit significantly increases the probability of discovering DV related physical abuse incidents. The magnitude of the coefficient is larger in the presence of a female officer with at least 10 years of experience. This implies that the significant rise in the probability of discovering DV related physical abuse when there exists a female officer in the primary unit in the main result is largely contributed by those with at least 10 years of experience.

## 4 Conclusion

This paper examines the effects of having a female officer in the primary unit on the discovery of DV in physical abuse incidents. It exploits the as-good-as-random variation in the existence of a female officer in the primary unit in calls for service dispatch at the Milwaukee and Chicago Police Departments. Results provide strong evidence that female officers play an important role. Having a female officer in the primary unit scales up reports of DV in physical abuse incidents by 10% in the Milwaukee Police Department. Results from the Chicago Police Department also find positive effects. Estimates indicate that having a female officer in the primary unit scales up DV reports in physical abuse incidents by 13%. These

results can be driven by empathy and concerns from female officers (Rabe-Hemp, 2008), as well as preferences for female officers from victims (Harrington et al., 2003).

The paper also conducts two dimensions of heterogeneity analysis. First, it considers the heterogeneity of estimated effects by the timing of shifts. Results show that the significant increase in the probability of discovering DV related physical abuse when there exists a female officer in the primary unit is mostly contributed by those working in the shift from 4 pm-midnight in the Milwaukee Police Department, and it is mostly contributed by those working in the shift from 8 am-4 pm in the Chicago Police Department. Second, the paper considers the heterogeneity of estimated effects of having a more or less experienced female officer in the primary unit. Results from both police departments imply that the significant rise in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit is mostly contributed by those with at least 10 years of experience.

Overall, findings in this paper indicate that female officers play a vital role in discovering DV in physical abuse incidents. These findings have policy implications. The majority of police officers are male. Females are often considered to be less capable at policing (Miller & Segal, 2019). But results in this paper imply that when male officers are the only ones dispatched in the primary unit, DV may not be discovered and can be under-reported. Therefore, it is important to have a female officer in the primary unit so that more DV incidents can be discovered and reported in physical abuse incidents. These results further justify that female officers are an indispensable part in the police force.

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## Tables

Table 1: Call types for DV related physical abuse and physical abuse only in the Milwaukee Police Department

Call types for DV related physical abuse	Call types for physical abuse only
ABDUCTION-DV BATTERY DV BATTERY CUTTING-DV FIGHT-DV HOSTAGE SIT-DV RECK USE OF W-DV SHOTS FIRED-DV SUBJ WITH GUN-DV SUBJ W/WEAPON-DV	ABDUCTION BATTERY BATTERY CUTTING FIGHT HOSTAGE SITUATION RECK USE OF WEAP SHOTS FIRED SUBJ WITH GUN SUBJ WITH WEAPON

Table 2: Summary statistics for call types related to physical abuse only in Milwaukee Police Department

Time between call and dispatch (in minutes)	9.450 (26.658)
Call from home district of officer with more years of experience in primary unit	0.953 (0.212)
Female officer in primary unit	0.214 (0.410)
Black officer as officer with more years of experience in primary unit	0.173 (0.378)
Hispanic officer as officer with more years of experience in primary unit	0.140 (0.347)
White officer as officer with more years of experience in primary unit	0.642 (0.479)
Max years of experience for the officer in primary unit	10.694 (6.892)
Observations	102050

This table reports the mean, standard deviation, and the number of observations for each variable. About 21% of the primary units have female officers. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard deviations are in parentheses.

Table 3: Correlation between time between call entry and call dispatch and whether there exists a female officer in the primary unit using data from Milwaukee Police Department

	(1)	(2)
Female officer in primary unit	0.508 (0.415)	0.322 (0.414)
Observations	102050	102048
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average time between call and dispatch (in minutes)	9.450	9.450

This table reports the coefficient on *Female officer in primary unit* from regressions of time between call entry and call dispatch on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 4: Correlation between whether the call comes from the home district of the officer with more years of experience in the primary unit and whether there exists a female officer in the primary unit using data from Milwaukee Police Department

	(1)	(2)
Female officer in primary unit	-0.00932 (0.00831)	-0.00896 (0.00783)
Observations	102050	102048
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average probability of having a call from the home district of officer with more years of experience in primary unit	0.953	0.953

This table reports the coefficient on *Female officer in primary unit* from regressions of whether the call comes from the home district of the officer with more years of experience in the primary unit on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 5: The effect of having a female officer in the primary unit on discovering DV related physical abuse in Milwaukee Police Department

	(1)	(2)
Female officer in primary unit	0.00401** (0.00174)	0.00323* (0.00165)
Observations	102050	102045
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Call controls	No	Yes
Probability of having DV related physical abuse as the original call types	0.0301	0.0301

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse. Column (2) adds call controls that contain time between call and dispatch, whether the call is from the home district of the officer with more years of experience in the primary unit, race of the officer with more years of experience in the primary unit, as well as fixed effects for the day of the week, original call type, and max years of experience for the officer in the primary unit. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 6: The effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse in Milwaukee Police Department

	(1)
Female officer in primary unit for incidents in midnight-8 am shift	-0.00144 (0.00336)
Female officer in primary unit for incidents in 8 am-4 pm shift	0.00446 (0.00293)
Female officer in primary unit for incidents in 4 pm-midnight shift	0.00435* (0.00246)
Observations	102045
District-by-year-by-week-by-shift FE	Yes
Call controls	Yes

This table shows the effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse in Milwaukee Police Department. Estimates are based on the same model as column (2) of Table 4 (including district-by-year-by-week-by-shift fixed effects and call controls). Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 7: The effect of having a female officer with a minimum of 10 years of experience or one with less than 10 years of experience in the primary unit on discovering DV related physical abuse in Milwaukee Police Department

	(1)
Female officer $\geq$ 10 years of experience in primary unit	0.00507* (0.00293)
Female officer $<$ 10 years of experience in primary unit	0.00203 (0.00203)
Observations	101730
District-by-year-by-week-by-shift FE	Yes
Call controls	Yes

This table shows the effect of having a female officer with more and fewer years of experience in the primary unit on discovering DV related physical abuse. Estimates are based on the same model as column (2) of Table 4 (including district-by-year-by-week-by-shift fixed effects and call controls). Incidents that have a female officer with  $\geq$  10 years of experiences in primary unit and a female officer with  $<$  10 years of experience in primary unit at the same time are dropped. These incidents constitute about 0.3% in the sample. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 8: Call types for DV related physical abuse and physical abuse only in the Chicago Police Department

Call types for DV related physical abuse	Call types for physical abuse only
DOMESTIC BATTERY	BATTERY IP BATTERY JO BATTERY REPORT BATTERY VICTIM INJ.

Table 9: Summary statistics for call types related to physical abuse only in Chicago Police Department

Time between call and dispatch (in minutes)	5.023 (13.013)
Call from home district of officer with more years of experience in primary unit	0.965 (0.183)
Female officer in primary unit	0.316 (0.465)
Black officer as officer with more years of experience in primary unit	0.196 (0.397)
Hispanic officer as officer with more years of experience in primary unit	0.118 (0.322)
White officer as officer with more years of experience in primary unit	0.422 (0.494)
Max years of experience for the officer in primary unit	10.606 (7.916)
Observations	184189

This table reports the mean, standard deviation, and the number of observations for each variable. About 32% of the primary units have female officers. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard deviations are in parentheses.

Table 10: Correlation between time between call entry and call dispatch and whether there exists a female officer in the primary unit using data from Chicago Police Department

	(1)	(2)
Female officer in primary unit	-0.132 (0.0861)	-0.0456 (0.0836)
Observations	184189	184040
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Averag time between call and dispatch (in minutes)	5.023	5.023

This table reports the coefficient on *Female officer in primary unit* from separate regressions of time between call entry and call dispatch on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.



Table 11: Correlation between whether the call comes from the home district of the officer with more years of experience in the primary unit and whether there exists a female officer in the primary unit using data from Chicago Police Department

	(1)	(2)
Female officer in primary unit	-0.00324** (0.00152)	-0.00274* (0.00150)
Observations	184189	184040
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average probability of having a call from the home district of officer with more years of experience in primary unit	0.965	0.965

This table reports the coefficient on *Female officer in primary unit* from separate regressions of whether the call comes from the home district of the officer with more years of experience in the primary unit on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 12: The effect of having a female officer in the primary unit on discovering DV related physical abuse in Chicago Police Department

	(1)	(2)
Female officer in primary unit	0.00567*** (0.00131)	0.00426*** (0.00133)
Observations	184189	184040
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Call controls	No	Yes
Probability of having DV related physical abuse as the original call type	0.0280	0.0280

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse. Column (2) adds call controls that contain time between call and dispatch, whether the call is from the home district of the officer with more years of experience in the primary unit, race of the officer with more years of experience in the primary unit, as well as fixed effects for the day of the week, original call type, and max years of experience for the officer in the primary unit. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 13: The effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse in Chicago Police Department

	(1)
Female officer in primary unit for incidents in midnight-8 am shift	0.00311 (0.00266)
Female officer in primary unit for incidents in 8 am-4 pm shift	0.00789*** (0.00251)
Female officer in primary unit for incidents in 4 pm-midnight shift	0.00260 (0.00184)
Observations	184040
District-by-year-by-week-by-shift FE	Yes
Call controls	Yes

This table shows the effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse in Chicago Police Department. Estimates are based on the same model as column (2) of Table 8 (including district-by-year-by-week-by-shift fixed effects and call controls). Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 14: The effect of having a female officer with a minimum of 10 years of experience or one with less than 10 years of experience in the primary unit on discovering DV related physical abuse in Chicago Police Department

	(1)
Female officer $\geq 10$ years of experience in primary unit	0.00546** (0.00228)
Female officer $< 10$ years of experience in primary unit	0.00371** (0.00156)
Observations	181054
District-by-year-by-week-by-shift FE	Yes
Call controls	Yes

This table shows the effect of having a female officer with more and fewer years of experience in the primary unit on discovering DV related physical abuse. Estimates are based on the similar model as column (2) of Table 8 (including district-by-year-by-week-by-shift fixed effects and call controls). Incidents that have a female officer with  $\geq 10$  years of experiences in primary unit and a female officer with  $< 10$  years of experience in primary unit at the same time are dropped. These incidents constitute about 1.6% in the sample. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

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## Appendix

Table A1: List of the twenty police departments with FOIA requests sent

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Atlanta Police Department
Baltimore Police Department
Baton Rouge Police Department
Chicago Police Department
Cincinnati Police Department
Cleveland Police Department
Detroit Police Department
Indianapolis Police Department
Kansas City Police Department
Memphis Police Department
Metropolitan Police Department of the District of Columbia
Milwaukee Police Department
Mobile Police Department
Newark Police Department
New Orleans Police Department
Philadelphia Police Department
Pittsburgh Police Department
St. Louis Police Department
Stockton Police Department
Tulsa Police Department

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Table A2: The effect of having a female officer in the primary unit on discovering DV related physical abuse in Milwaukee Police Department using logit regression

	(1)
Female officer in primary unit	1.105** (0.0468)
Observations	102050
District-by-year FE	Yes
District-by-year-by-week-by-shift FE	No
Call controls	No

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse using logit regression. Results are odds ratios. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table A3: The effect of having a female officer in the primary unit on discovering DV related physical abuse in Chicago Police Department using logit regression

	(1)
Female officer in primary unit	1.111*** (0.0265)
Observations	184189
District-by-year FE	Yes
District-by-year-by-week-by-shift FE	No
Call controls	No

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse using logit regression. Results are odds ratios. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.