Figure 2 illustrates the estimated impact of concentrated disadvantage on total crime, violent crime, and property crime rates in Los Angeles County using a Spatial Durbin Model (SDM) with 95% confidence intervals overlaid. Each panel represents a specific crime type with four types of estimates: Non-spatial model (OLS), Direct, Indirect, and Total effects. The vertical bands represent 95% confidence intervals indicating the range within which the true effect is likely to fall with a high degree of certainty. Statistical significance at the 95% level is implied when the confidence interval does not cross zero (red dotted line) suggesting that the effect is likely not due to random chance. Please refer to Appendix for the full result table for the non-spatial and SDM models (Table A1), as well as the average direct, indirect, total effects based on the simulation (Table A2). Specifically, the OLS panels in Figures 2, 4, 5, and 6 correspond to the OLS results in Table A1 for each crime type, while the Direct, Indirect, and Total effect panels in Figures 2, 4, 5, and 6 align with the SDM results reported in Table A2.

In the Total Crime panel in Figure 2, the non-spatial model – not accounting for spatial dependencies (named "OLS") suggests a negligible effect of concentrated disadvantage on total crime rate in block groups as the confidence interval crosses zero. When spatial dependencies are considered, the "Direct" estimate shows a slight increase in the effect, but it remains statistically insignificant, which indicate a limited direct influence of concentrated disadvantage on total crime in the focal area. However, the "Indirect" impact is larger and statistically significant (the confidence interval staying above zero). This finding suggests that concentrated disadvantage has a statistically significant spillover effect that increases crime rate in nearby areas, although it has no significant direct impact on crime in the focal area. The "Total" impact (combining both direct and indirect effects) is also statistically insignificant.

Next, in the Violent Crime panel in Figure 2, we observe a different pattern. The OLS estimate of concentrated disadvantage for violent crime is now positive and statistically significant indicating a substantial direct impact even without spatial controls. However, when

spatial dependencies are considered, the Direct impact becomes insignificant. Importantly, the Indirect impact is positive and statistically significant, which implies that concentrated disadvantage in adjacent areas is positively associated with violent crime rate in a given focal block group. The statistically significant Total impact further confirms the cumulative influence of concentrated disadvantage on violent crime across spatially connected areas. These findings suggest the importance of considering the effects of concentrated disadvantage in surrounding areas (spillover) for understanding violent crime in the focal area. In contrast, the Property Crime panel shows negative but statistically non-significant effect of concentrated disadvantage on property crime rate. The Direct and Indirect estimates with confidence intervals crossing zero indicate that concentrated disadvantage may have a protective effect for property crime rate, but those effects are not statistically significant. Likewise, the Total impact combining direct and indirect effects shows a cumulative and negative association with property crime but such an effect is statistically not significant.

[Figure 1 about here.]

Another advantage of the proposed method is that we can predict the impact of our independent variable on each geographical unit in a more nuanced way by visually presenting direct, indirect, and total effects. By doing so, we can visualize the localized influence of an independent variable within a specific unit (the direct impact) as well as the spatial spillover influence of neighboring areas (the indirect impact). Such a visualization may provide valuable insights as it enhances our understanding for how structural characteristics in one area can shape spatial crime patterns both in the focal unit as well as the surrounding areas. In our study, we operationalize this idea by creating exploratory intensity scores. Specifically, we multiply each area's values of concentrated disadvantage and its spatial lag by the effects estimated from the SDM. This generates direct, indirect, and total effect maps that highlight areas of greater potential influence under average conditions. It is important to note, however, that these are not true unit-specific impacts of the model. Rather, the

values reflect average-effect scaling intended for exploratory purposes and should not be interpreted as the unit-specific effects implied by the full spatial model.

For example, the maps in Figure 3 illustrate the total and spatial spillover effects of concentrated disadvantage on violent crime in the block groups in the entire study area (Panels a and c) as well as near South Los Angeles in our study area (Panels b and d). These maps highlight the spatial heterogeneity in how concentrated disadvantage influences crime, both locally and through its diffusion to neighboring areas. Panel (a) and (b) show the indirect impact (spillover), which represents the extent to which disadvantage in one area influences crime rates in neighboring areas. The shading pattern reveals that areas with higher levels of concentrated disadvantage generate spillover effects that increase crime rates in adjacent neighborhoods, especially those shaded in darker green, which indicate stronger spillover impacts. We did not map the direct impact of concentrated disadvantage as they were proved to be statistically insignificant as Figure 2 shows. Panels (c) and (d) display the total impact (sum of direct and indirect impacts), which combines the effects of disadvantage within each block group and the spillover effects from neighboring block groups. Distinguishing total vs. indirect impacts provides a more comprehensive understanding of how concentrated disadvantage influences crime, both within the area itself and through its effects on surrounding regions. The stronger color intensity in many block groups in Panel (d), compared to Panel (b), emphasizes that the cumulative effect of concentrated disadvantage is substantial when both direct and indirect impacts are considered.

For example, in Figure 3b, we highlight two adjacent Block Groups in South Los Angeles, outlined in red on the map. These Block Groups display differing magnitudes of the estimated indirect effects of concentrated disadvantage on violence, represented by their shading (dark vs. medium green). The darker green area indicates a stronger indirect effect, suggesting that this block group exerts a greater spatial spillover of violence—not only to its immediate neighbor but also to other nearby areas. In contrast, the medium green Block Group exhibits a relatively weaker indirect effect implying that it transmits less violence

outward. Conceptually, this spatial pattern suggests that violence tends to "flow downhill" from areas with stronger indirect effects (dark green) to those with weaker ones (light green), rather than in the opposite direction.

[Figure 2 about here.]

Next, Figure 4 illustrates the impact of homeownership on three types of crime incidents. In the Total Crime panel, the OLS estimate shows a negative impact of homeownership on total crime. This indicates that block groups with more homeowners tend to have lower total crime risk. The Direct impact (accounting for spatial dependencies) also shows a negative and statistically significant effect, which suggests that more homeowners in a block group decreases total crime risk in that block group. Both the Indirect and Total effects are also statistically significant indicating that the percent homeowners reduces crime in the focal block group as well as those in nearby. This finding suggests that the crime-reducing effect of homeownership on total crime is substantial so that the crime control benefit from more homeowners in a block group spatially extends beyond the immediate area. We found similar patterns for violent and property crime types (although the indirect effect for violent crime is statistically not significant). In summary, Figure 4 shows that while homeownership is associated with reduced crime risk in block groups, it exhibits significant spillover (indirect) effects on crime in surrounding areas.

[Figure 3 about here.]

Next, Figure 5 focuses on the impact of the Asian American population. We see consistent and statistically significant negative associations between the percent Asian and all types of crime. Specifically, the OLS and Direct estimates suggest that more Asian residents in a block group is negatively associated with crime in that block group. The Total impacts are also negative and statistically significant but the indirect effect (the spillover effects on neighboring areas) is statistically significant only for violent crime. The findings underscore

that the crime-reducing effect (especially for violent crime) from the percent Asian spatially extends beyond immediate neighborhoods.

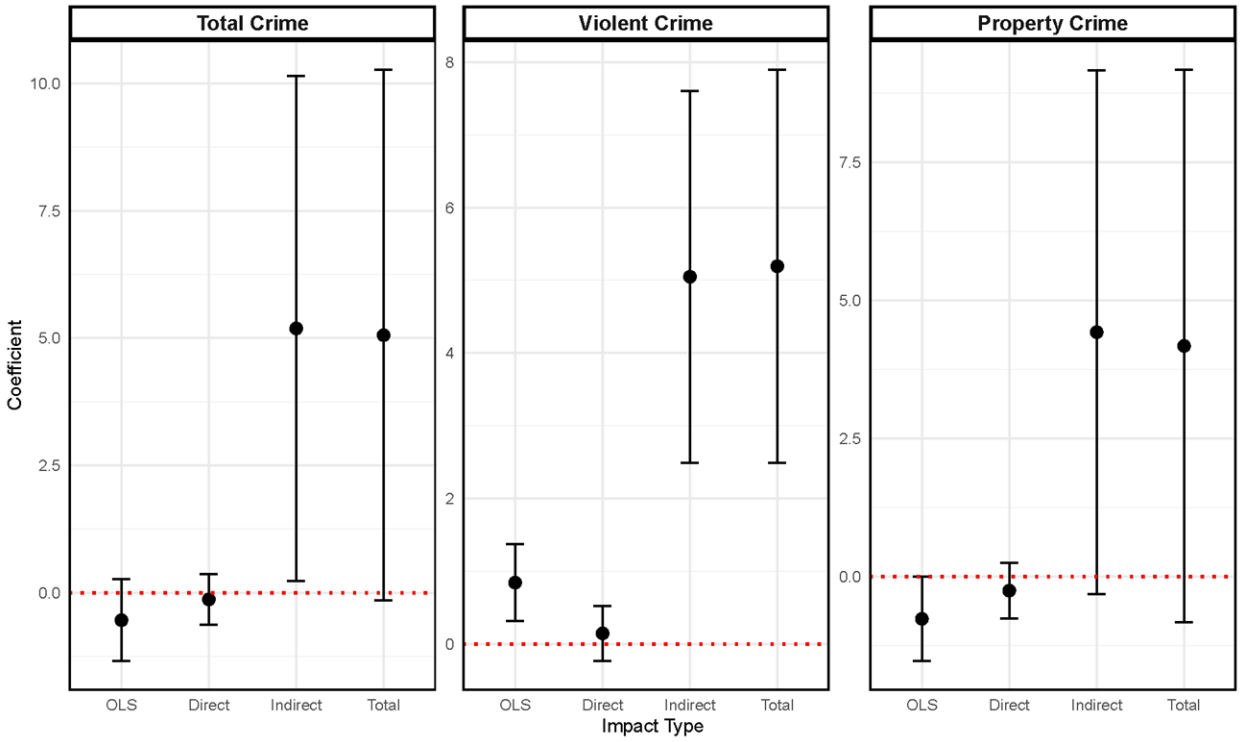
Next, Figure 6 examines the effect of Latino residents on crime incidents. The result reveals a similar but slightly more nuanced pattern. The Direct impacts indicate significant reductions in total and property crime in areas with higher Latino populations. This suggests that Latino communities may help reduce crime within their immediate neighborhoods. However, the spillover effects, captured by the Indirect and Total impacts, are less consistent and insignificant for all crime types. This indicates that Latino communities may exert a more localized effect on crime reduction particularly with respect to total and property crime. Taken together, Figures 5 and 6 demonstrate that both Asian and Latino residents in neighborhood are negatively associated with crime in the study area, although the effects vary by crime type and the extent of spillover influence. Note that we do not report the results for percent African American as none of the associated spatial effects were statistically significant.

[Figure 4 about here.]

[Figure 5 about here.]

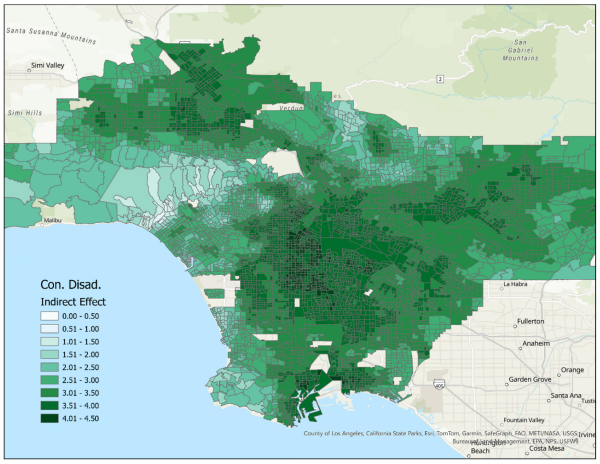
Figures

Figure 1: The Effect of Concentrated Disadvantage on Various Crime Types

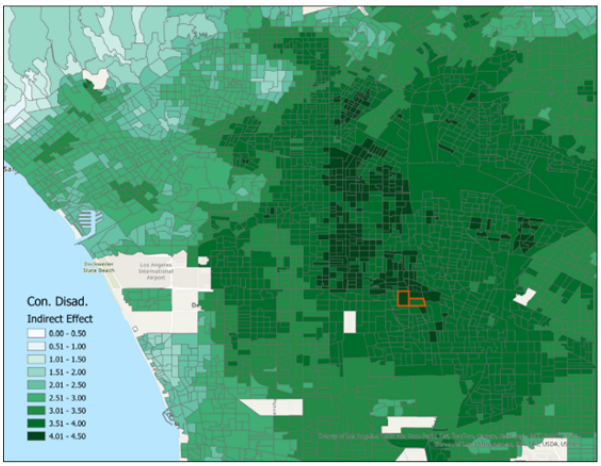


Note: The bands represent 95% confidence intervals. OLS represents the coefficients derived from OLS; Direct, Indirect, and Total indicate estimates from the Spatial Durbin Model.

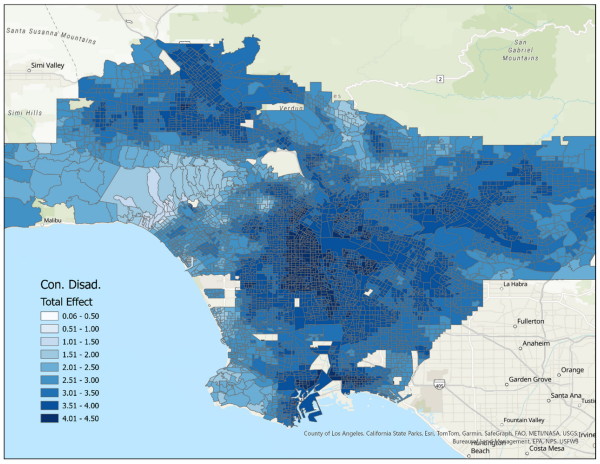
Figure 2: The Indirect Effect of Concentrated Disadvantage on Violent Crime



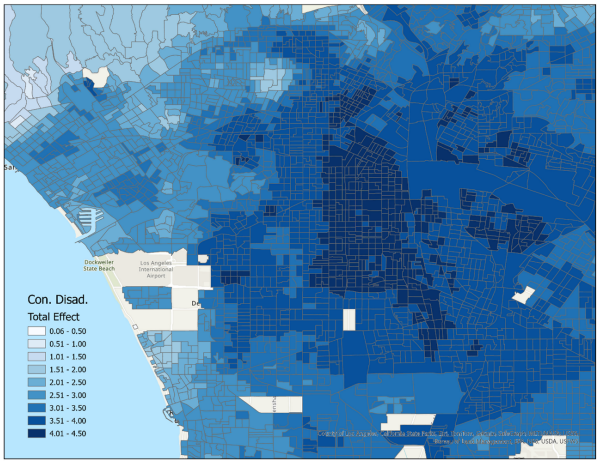
(a) Indirect Effect (Full Study Area Extent)



(b) Indirect effect (South Los Angeles Area)

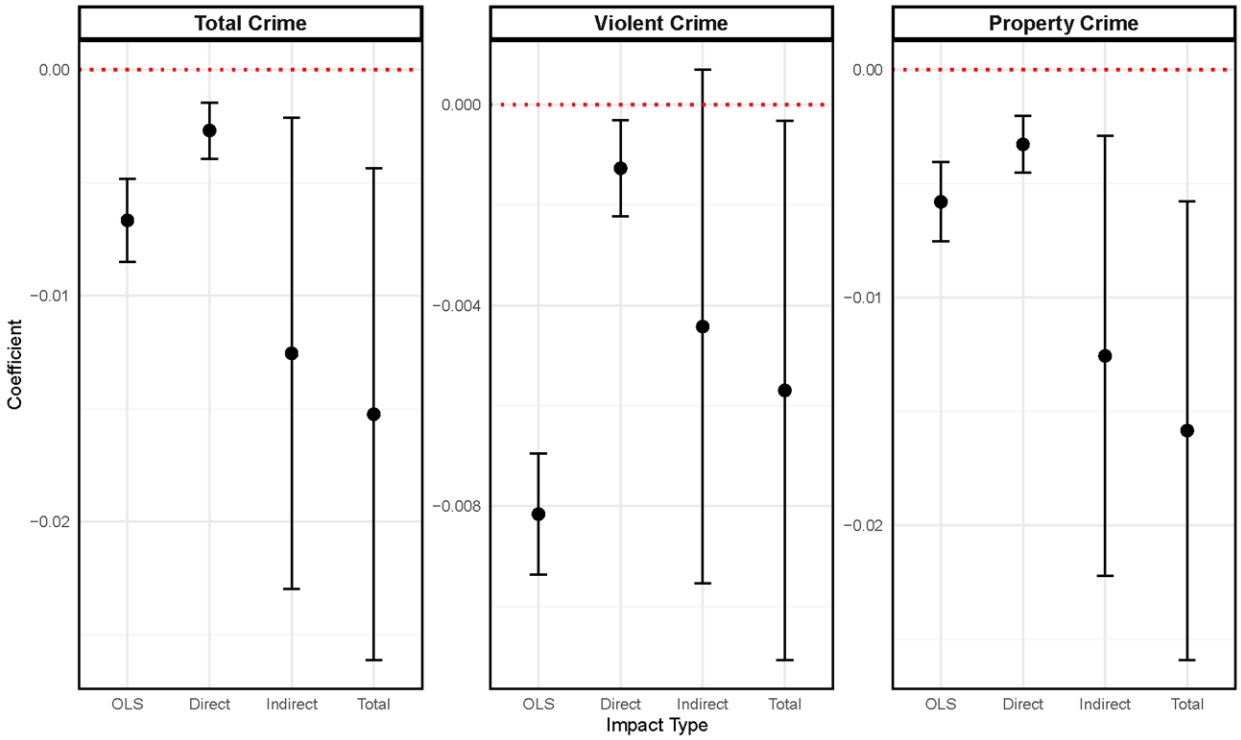


(c) Total Effect (Full Study Area Extent)



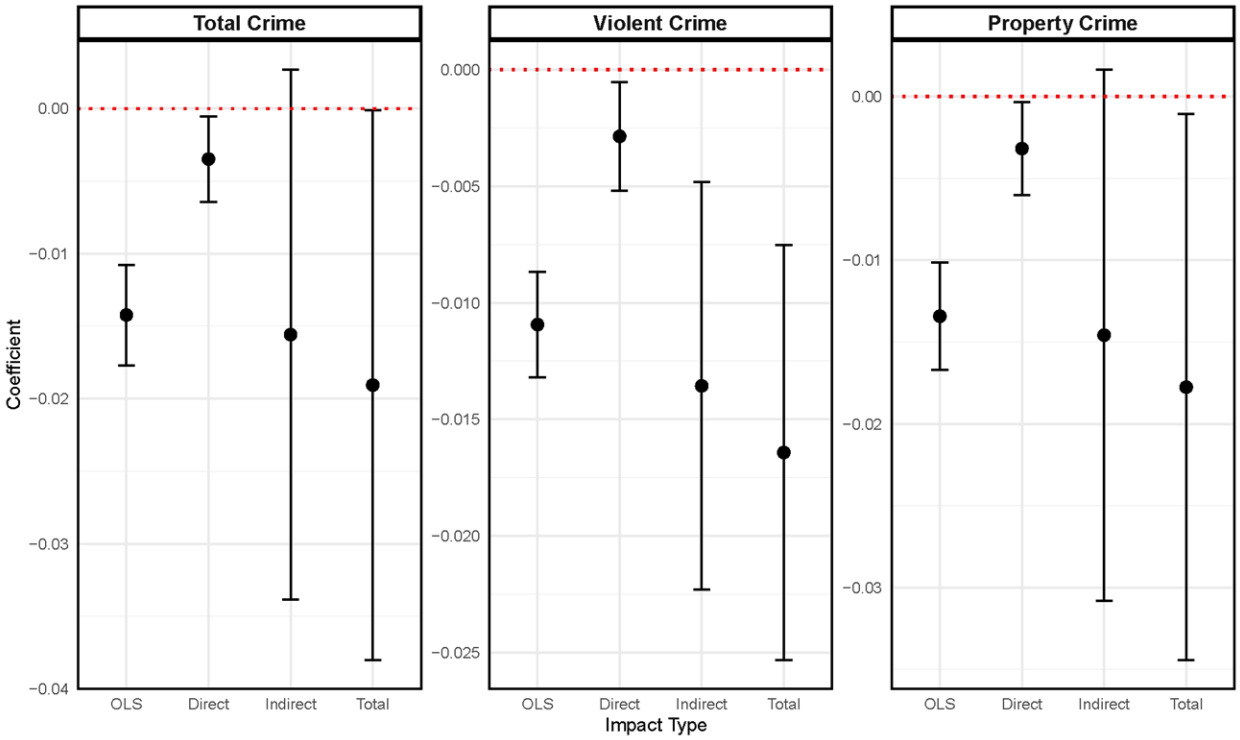
(d) Total effect (South Los Angeles Area)

Figure 3: The Effect of % Homeowners on Various Crime Types



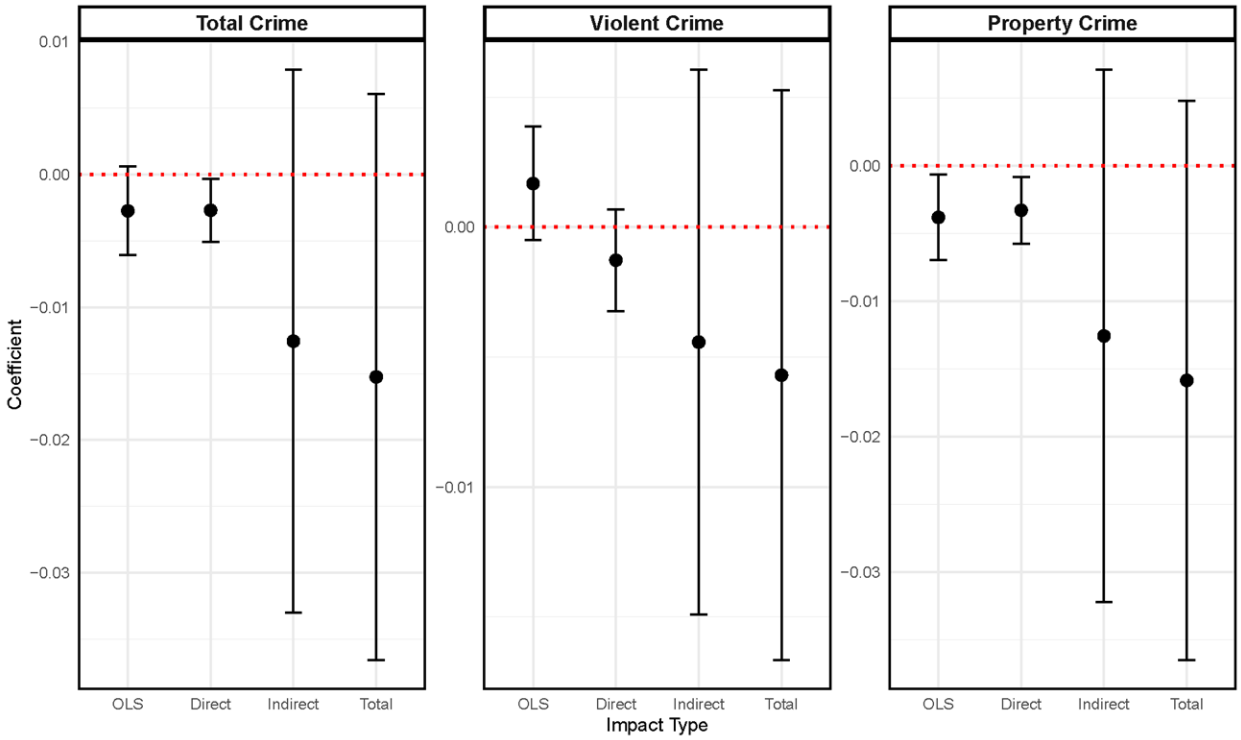
Note: The bands represent 95% confidence intervals. OLS represents the coefficients derived from OLS; Direct, Indirect, and Total indicate estimates from the Spatial Durbin Model.

Figure 4: The Effect of % Asian on Various Crime Types



Note: The bands represent 95% confidence intervals. OLS represents the coefficients derived from OLS; Direct, Indirect, and Total indicate estimates from the Spatial Durbin Model.

Figure 5: The Effect of % Latino on Various Crime Types



Note: The bands represent 95% confidence intervals. OLS represents the coefficients derived from OLS; Direct, Indirect, and Total indicate estimates from the Spatial Durbin Model.