

Nearest-neighbor Separations of Economic and Administrative Buildings in a Self-organized Urban Setting

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Decentralised and organically grown cities, especially in the developing world, have to contend with the different pressures such as the degradation of the environment, the ever-growing population, and scarcity of space and resources, among others. In these urban environments, government regulators are oftentimes faced with decisions that require a balancing act between the business interests and the well-being of the general population. These decisions, in turn, lead to tangible effects on the physical space of the city, and are manifested in the spatial formation of buildings and other physical structures [1, 2].

Here, we quantify the spatial arrangement of two types of buildings in the cities of Manila and Quezon in the National Capital Region of the Philippines. The *administrative* buildings are government-owned buildings that provide service to the general population such as city halls, health centres, police and fire stations, postal offices, among others. On the other hand, the *economic* buildings are the privately-owned structures that are primarily intended for business and commercial purposes. Our data set is extracted from crowd-sourced data from Open Street Map, which are manually assessed for accuracy using data from local government zoning records and national government census data. We have chosen Manila and Quezon City because they are the oldest and largest (by area) cities, respectively, in the Metro Manila conurbation.

In our analyses, we created the k -nearest-neighbor network of all administrative and economic buildings up to the with k_{nn}^{th} nearest connections, and determine the straight point-to-point distance of the connection. In Figure 1(a) and (b), a side-by-side comparison of the statistics of the administrative and economic buildings nearest-neighbours distance, $p(d)$, for Manila and Quezon City, respectively, is presented. In both cases, and for different k_{nn} values, the administrative $p(d)$ are shifted to longer separation distances by almost an order of magnitude. This is in line with the purpose and mechanism involved in their formations. The administrative buildings have to be *separated* to be able to service a wider area more efficiently. In contrast, economic buildings *cluster* due to zoning restrictions and the natural tendency of competitors to be close to each other.

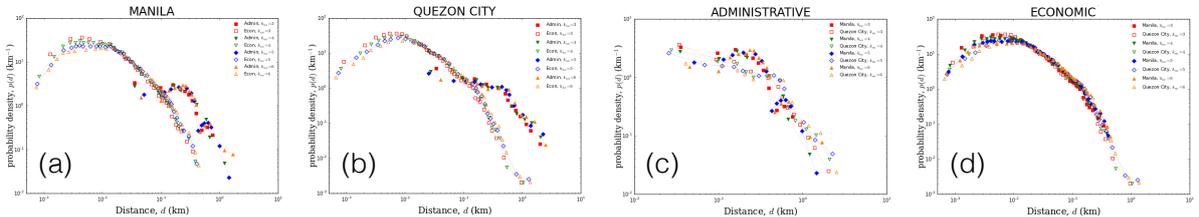


Figure 1: (a)-(b) Administrative and economic buildings separation distances $p(d)$ for (a) Manila and (b) Quezon City, showing longer distances for administrative buildings. (c)-(d) Combined Manila and Quezon City statistics for (c) administrative and (d) economic $p(d)$. The economic distributions collapse under one curve.

To further highlight the similarities and differences between administrative and economic $p(d)$, we present the combined Manila and Quezon City data in Figure 1(c) and (d), respectively.

The administrative $p(d)$ are both unimodal but have different characteristic values, as shown in Figure 1(c). In contrast, the economic $p(d)$ have comparable modes, linear intermediate regimes, and tails. While this similarity has yet to be confirmed for other cities, this hints at the possibility that the mechanisms for the growth of business centers are also similar.

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