The Determinants of Coagglomeration: Evidence from Functional Employment Patterns

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Motivation
Location patterns are not random.¹²,³ The geographic concentration of individual industries—e.g., Silicon Valley or the City of London—or the coagglomeration of industry pairs—e.g., textile and apparel in 19th century NYC or Montréal—is driven by firms’ and workers’ desire to minimize the costs of moving ‘goods, people, and ideas’. It has positive effects on outcomes like productivity or innovation.

Functional patterns are not random either.¹⁴,² Progress in ICT allows firms to split different activities across different locations. This can be observed at the international scale—e.g., outsourcing of production to China—but also nationally—research and management in large cities, and production in less urban areas. Identifying the mechanisms of geographic concentration is challenging. Yet, different locations are specialized in different industries and functions, and this variation is useful to identify those mechanisms. Do industries cluster because of the costs of moving goods, people, and ideas? Or because of reasons unrelated to those factors (e.g., access to infrastructure)? Little is known about how agglomeration forces drive jointly location patterns and functional patterns.⁵,⁶

Main objective and key idea
We want to better identify the determinants of geographic concentration using variation in both location and functional patterns. The key idea is the following:

• Different functions require different interactions. Production may be more sensitive to the local presence of vertically linked suppliers and skilled workers, whereas research may be more sensitive to the local presence of knowledge.

• Industry pairs that intensively share ‘ideas’ should coagglomerate their ‘idea-intensive’ functions (e.g., research)—while industry pairs that share lot of ‘goods’ should coagglomerate their ‘goods-intensive’ functions (e.g., production).

Data and methodology
We combine two key datasets:

• Canadian special census tabulations that split industry-level employment by census division, functional type, and rural-urban status.

• Business register geocoded plant-level data, with extensive coverage of the manufacturing sector (we work with NAICS 4-digit manufacturing industries).

Empirical strategy:

• Use census tabulations to split plant-level employment into broad functional types (‘Management and research’; ‘Clerical’; ‘Retail and services’; ‘Production’).


• Run multivariate regressions to identify the determinants of coagglomeration, using both overall employment and employment by functional type.

Determinants of coagglomeration
We run regressions of the following form:

\[
\text{coaggl}^\text{ijt} = \alpha_{\omega} \omega_{ijt} + \alpha_{ces} \text{ces}_{ijt} + \alpha_{\text{know}} \text{now}_{ijt} + X_{ijt} \delta + \zeta_j + \xi_t + \epsilon_{ijt}.
\]

• Proxies for the agglomeration forces: ‘goods’ (input-output links, io); ‘people’ (labor similarity, ces); ‘ideas’ (knowledge sharing, know).

• Controls ($X_{ijt}$), industry- and time-fixed effects ($\zeta_j$, $\xi_t$), i.i.d. error term ($\epsilon_{ijt}$).

Key findings
Different functions display different location patterns—some with short and some with long spatial ranges. Different functions also benefit differently from access to ‘goods, people, and ideas’. In particular:

• Input-output links (‘goods’) and labor similarity (‘people’) are about equally important—the former operating across larger spatial scales.

• Knowledge sharing (‘Ideas’) is important for the coagglomeration of management and research and clerical employment, but not for other functions.

• The average effects across all functions that we estimate when using total employment masks substantial heterogeneity.

Our findings also point to the importance of rather neglected identification issues:

• Coagglomeration of A and B can be due to a third industry C, even when there are no agglomeration benefits between A and B (but between A-C and B-C).

• Coagglomeration often takes place within firms—multiple complementary activities—but we cannot measure it usually.

References

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**Figure 1. Coagglomeration of NAICS 3361 (red) and 3363 (blue) in Ontario. Census metro divisions in grey shades.**

**Figure 2. Functional splits by rural-urban (top), and # of coagglomerated pairs by function and distance (bottom).**

**Table 1. OLS regression results, industry and year fixed effects included. With controls. N=10,292.**