

Does nearby congestion affect productivity?

Evidence from Flanders and the Brussels Capital-Region

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Business activities tend to be geographically concentrated as economic theory predicts that firms in highly agglomerated locations are more productive relative to firms in less dense areas. According to Marshall (1890), firms put forward three motives to locate close to each other being input-output linkages, labor market pooling and knowledge spillovers, allowing for different types of transportation cost reductions. Locational proximity thus reduces the costs of moving raw inputs or shipping final goods to downstream customers, facilitates a better match between firms and workers, and speeds the rate of innovation (Ellison *et al.*, 2010). These local agglomeration benefits which crucially depend on easy access to economic inputs can, however, be inhibited when transaction costs increase. A range of agglomeration diseconomies such as high land rents, higher prices for factor inputs, air or noise pollution, crumbling infrastructure and traffic congestion might reduce these benefits (Sweet, 2014). Hence, adverse traffic conditions are most likely to harm economic activity due to the additional time and transportation costs, as well as the reduced access to specialized labor, intermediate inputs or delivery markets (Weisbrod *et al.*, 2001).

Using data for the period 2010 to 2014 for Flanders and the Brussels Capital Region, this paper investigates whether and to what extent agglomeration externalities have an impact on firm performance. Belgium, as a small open economy at the heart of Europe, is severely affected by congestion, and is therefore particularly suitable for studying agglomeration and congestion effects. The strong service economy anchored on public institutions partly explains the ever-increasing traffic volumes in Brussels, while the port of Antwerp attracts a lot of heavy truck traffic being an important logistic hub in the heart of Europe.

This paper contributes to the literature in providing evidence that firm performance is affected by agglomeration externalities. First, accounting for both positive and negative externalities, this

paper extends beyond the traditional literature as we are able to disentangle the size of these opposing agglomeration forces. Up to now, little research studying these effects simultaneously has been carried out; some studies such as Rizov *et al.* (2012), however, study the net impact of agglomeration as they are unable to isolate the effect of congestion from the gains of agglomeration. Therefore, we argue this our paper is perhaps the first to quantify both the magnitude of agglomeration and congestion effects on firm-level productivity. Second, the proposed methodology has the advantage of relying on actual congestion measures instead of proxies for crowdedness such as land prices and wage data or the number of regionally registered cars per kilometer of road to investigate the link between productivity and congestion (Broersma & van Dijk, 2008; Rizov *et al.*, 2012). Moreover, our congestion measures *lost vehicle hours* and *lost vehicle hours in traffic* simultaneously account for time and distance losses due to slow traffic (Hymel, 2009; Vlaams Verkeerscentrum, 2016). Third, we construct firm-specific agglomeration and congestion indicators which have the benefit of (1) accounting for the fact that the interaction between firms and the highway network is subject to a spatial decay (Rosenthal & Strange, 2003; Graham *et al.*, 2010; Combes *et al.*, 2012), and (2) defining the geographical neighborhood of each firm using circular influence zones instead of predefined administrative zones avoiding a bias of the empirical results when dealing with localized industries crossing administrative boundaries (Duranton & Overman, 2005). Fourth, we propose a two-stage estimation procedure in which firm performance is first calculated from an econometrically estimated production function proposed by Akerberg *et al.* (2015), and is then regressed on our firm-specific agglomeration and congestion measures and their interaction effect for the reason that these externalities are not mutually exclusive as they operate simultaneously. Finally, we account for differential effects of agglomeration and crowdedness on firms belonging to different sectors including firms from agriculture and mining, manufacturing and private service sectors as some sectors might value face-to-face interactions and proximity to other businesses more (Sweet, 2014; Hou, 2016).

The main findings can be summarized as follows. We obtain statistically significant effects of agglomeration and nearby congestion on firm-level productivity for Flanders and the Brussels-Capital Region; the gains from a 10% increase in agglomeration on productivity fluctuate from 0.32 to 1.60%, while the productivity losses from a 10% increase in congestion range from 0.63 to 1.01%, depending on the level of spatial concentration and the chosen measure of congestion. We demonstrate that while agglomeration externalities are limited in space (up to 5km), congestion externalities are less localized for the reason that firms on average have access

to the nearest highway within a 3 to 5km radius. Moreover, we find that agglomeration and congestion effects vary greatly across regions within Flanders and the Brussels-Capital Region.

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