Does nearby congestion affect productivity?

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Local or regional markets remain important economic actors in everyday life in spite of globalization. In this regard, economic theory predicts that firms cluster together in the event of agglomeration economies allowing for three types of transportation cost reductions: the costs of moving goods, people, and ideas (Marshall, 1890). These advantages of localization, which depend crucially on easy access to economic inputs, can, however, be inhibited when transaction costs increase (Sweet, 2014). A range of disadvantages such as high land rents, traffic congestion, pollution or noise might therefore hamper the interaction and competition between firms (Saito & JunJie, 2016). Consequently, the aim of this research is to provide an insight in the role of agglomeration economies and its most visible byproduct congestion on firm-level productivity.

Many researchers have investigated the link between agglomeration economies – both positive and negative – and productivity over the past decades. Although agglomeration forces are long taken for granted, no consensus exists on the impact of concentrated industrial structures on firm performance. Drucker & Feser (2012) find evidence that productivity can be affected either positively or negatively by clustering depending on the level of concentration. Besides, Melo et al. (2009) argue that although localization economies are generally found to be positive, the reported estimates might vary greatly in magnitude. In general, two types of research have recently been carried out being (1) studies focusing on the effect of agglomeration economies on regional employment or labor productivity growth using aggregate data (for example, Broersma & van Dijk, 2008; Hymel, 2009; Broersma & Oosterhaven, 2009; Sweet, 2014; Saito & JunJie, 2016), and (2) studies investigating the impact of agglomeration economies on firm-level total factor productivity (TFP) (for example, Graham, 2007; Martin et al., 2011; Rizov et al., 2012; Ehrl, 2013).

We contribute to the literature by providing evidence from within-firm productivity changes due to clustering and congestion. To the best of our knowledge, we are the first to simultaneously control for positive and negative externalities arising from localization when estimating firm-level productivity. To this purpose, we extend the De Loecker (2013) methodology to estimate productivity (TFP) in order to investigate whether and to what
extent firm-level productivity is affected by agglomeration economies. Furthermore, contrary to the vast majority of the literature, we map out the geographical neighborhood of each firm using influence zones with various band widths instead of predefined administrative zones, see Figure 1. By directly using distance between firms rather than aggregating observations within administrative units, we avoid a downwards bias when dealing with localized industries crossing administrative boundaries (i.e. border effect, Duranton & Overman, 2005). Moreover, agglomeration economies facilitated by other firms as well as traffic congestion from nearby highways are assumed to attenuate in inverse proportion with distance (Rosenthal & Strange, 2003; Graham et al., 2010; Combes et al., 2012). We obtain localization measures by aggregating employment from complementary and different manufacturing sectors within each firm’s influence zone. In addition, our congestion measure is constructed by accumulating the annual average time lost on highways due to congested driving conditions (i.e. lost vehicle hours, Flemish Mobility Center, 2015), and it has the advantage of accounting for both time and distance losses due to traffic jams (Hymel, 2009).

Figure 1: Model measuring agglomeration patterns. The black dot shows the location of firm $i$ at the center of influence zone $R$ with band width $r$ represented by the gray area. In addition, the remaining dots represent the other firms $j = 1, 2, \ldots, J$ included in zone $R$ which might belong to a different sector $s = 1, 2, \ldots, S$.
Source: own representation.

We use data for Belgium for the period 2010-2014 (Bureau van Dijk, 2015; Flemish Mobility Center, 2015), and focus on manufacturing industries given that these sectors are most sensitive to congestion (Graham et al., 2010; Sweet, 2014). Belgium is particularly suitable for studying agglomeration and congestion effects given that Belgium’s metropolitan areas are among the most congested in Europe (INRIX, 2015). For example, the strong service economy anchored on public institutions partly explains the large 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. Moreover, the transportation infrastructure is likely
to have a major impact on the ability of firms to interact and compete as the majority of the manufacturing firms (51.8%) has access to a highway within a 3 km radius. We find evidence that there are indeed productivity gains and losses due to agglomeration economies, although these effects are limited in space. Being part of an economic cluster with a 5km radius increases next year’s productivity level by 0.47 to 0.56%, while congestion respectively decreases next year’s productivity level by 0.55 to 0.61%. These results imply that the positive agglomeration advantages are overruled by negative congestion effects caused by traffic jams, which is in line with earlier findings for the Netherlands [Broersma & van Dijk 2008].

**Keywords.** Agglomeration economies, traffic congestion, total factor productivity (TFP)

**References**


