CONGESTED DEVELOPMENT?
Examining the effect of traffic speeds on the location of new business establishments in Los Angeles

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ABSTRACT

It is widely assumed that traffic congestion is a significant burden on the economies of metropolitan regions. In this article, we suggest that the relationship between traffic congestion, as defined by the speed of travel across different parts of metropolitan regions, and economic activity is considerably more subtle and complex than is widely assumed. This study analyses the location of new business establishments (start-ups) in metropolitan Los Angeles for two industries, the entertainment and information technology (IT) industries, in 2009. There is a broad literature devoted to understanding why new business establishments locate where they do within regional economies. This research generally finds that firms of “basic” or tradable industries tend to exhibit a high degree of spatial clustering, or agglomeration. Since the performance of certain industries determines the success of regional economies, and co-location – or reduced impedance in the parlance of transportation planners – contributes to within sector productivity, our work draws on both transportation economics and economic geography to determine how transportation networks and delays on them affect the ability of industries to co-locate within regional economies. Our examination of these two basic industries suggests that while region-wide claims about the effect of traffic congestion on economic activity may have merit in the aggregate, it is more likely the case that accessibility is distinctively different among industries.
INTRODUCTION
The links between transportation and economic activity are intuitive, and assumed, yet surprisingly understudied. Transport is so central to all economic activity – in moving raw materials to factories, labor to worksites, inputs and outputs along supply chains, consumers to services, and products to consumers – that studying the role of transportation in the economy can seem an exercise in the obvious. It is widely held that lowering the generalized costs of travel (comprised broadly of time, risk/uncertainty, price, and externalities) increases productivity and facilitates economic growth (1). Likewise, it is widely assumed that traffic congestion – which reduces speeds and reliability, and increases prices and externalities – is a significant economic drag (2). But in this article we suggest that the relationship between traffic congestion and economic activity, both conceptually and empirically, is considerably more subtle and complex than the standard “faster-is-better” refrain would suggest.

The role of congestion in economic development is not simply an academic one. Claims that traffic congestion is a significant drag on metropolitan economies are rarely supported with evidence, yet they are used to justify enormous public expenditures on urban freeways and rail transit systems. Given both the scale and opportunity costs of such investments, public officials and transportation planners need a clear understanding of the links between transportation network performance and economic growth.

Studies of the economic effects of traffic congestion vary widely, particularly in relation to the scale of investigation, the measures of congestion and economic performance used, and the methodological approaches taken (3; 4). This variation renders it difficult to compare results and draw definitive conclusions across the literature.

The effect of congestion on economic outcomes has been examined at two primary scales. Some studies focus on the net effect of traffic congestion on economic performance across a range of cities and metropolitan economies (3; 5-7), while others examine the impact of traffic congestion on economic outcomes within regional economies (8; 9). Among these studies, while measures of congestion converge on the idea that traffic congestion increases travel time for road users compared to free-flowing driving conditions, individual indicators differ from study to study. Historically, such variation existed because transportation agencies used different measures and methodologies to record local network data, while others maintained no information pertaining to local road networks at all (10). The absence of standard indices made it difficult to compare individual studies and to test the net effect of congestion across a range of regions and times, without relying on crude proxies for congestion (10; 11). Encouragingly, new data sources, such as the Texas Transportation Institute’s Urban Mobility Report, have made it possible to compare across regions and to employ consistent measures across studies (see for example 3; 7).

Across studies, measures of economic performance differ greatly. In some cases, scholars seek to quantify the value of time delay, while others focus on employment growth, changes in productivity, the performance of individual industries or firm relocation (3-5; 7; 8; 12-14). In addition, the problem of endogeneity is the major statistical modeling constraint faced by scholars. Just as economic growth causes traffic congestion, traffic congestion can restrain economic growth. To this extent, the two variables – economic activity and traffic – are highly correlated with one another, but determining the direction of causation between the two variables has proved challenging (3; 7). Different approaches to overcoming this challenge, again, generate variation in the findings across these studies.
This article reports on our investigation of how traffic congestion affects economic performance in metropolitan Los Angeles. We focus in particular on two industries in 2008-09: the entertainment industry and the information technology (IT) industry. Entertainment and IT are considered “basic” or trade industries, since the primary consumption of their output occurs outside of the Los Angeles economy. To this extent, the industries represent income generators for the regional economy. A third “non-basic” industry, supermarkets and groceries, is briefly analyzed for comparison.

Distinct from the work of transportation scholars on transportation, congestion, and economic development is work by urban economists and economic geographers that examines the location behavior of industries within and across regions. The productivity advantages of particular locations are inferred from the decisions that business owners and managers make about where to locate, assuming rational utility-maximizing behavior. This research generally finds that, within regional economies, firms of basic or tradable industries tend to exhibit a high degree of spatial clustering, or agglomeration (15-17). The benefits of agglomeration are generally assumed to be a function of easy linkages among firms that routinely conduct business with one another, so-called “knowledge spillovers” resulting from frequent extra-workplace interactions among skilled employees in a given industry, and optimal access to specialized, high-skill labor markets (18). Yet these business location studies are largely silent on the role that the transportation network plays in facilitating or discouraging such clustering. Since the performance of certain industries determines the success of regional economies, and co-location – or reduced impedance in the parlance of transportation planners – contributes to within sector productivity, our work draws on both transportation economics and economic geography to determine how transportation networks and delays on them affect the ability of industries to co-locate within regional economies.

THEORY AND EVIDENCE

Traffic Congestion

Traffic congestion typically refers to travel delay on road networks and is measured in numerous ways: average peak-period speeds on links in the transportation network, so-called “level of service” calculations (most typically applied to intersections), and, increasingly, the additional amount of time required to travel during peak periods relative to off-peak, free-flows speeds or posted speed limits (19).

The long-term causes of traffic congestion are many: population and job growth rates that exceed the rate of growth of road supply, increasing incomes and/or decreasing auto operating costs, concentration of economic activities in locations and at times that concentrate traffic flows, low-density, auto-oriented development, and limited alternatives to motor vehicle travel (20). Varying combinations of these factors have ensured that traffic congestion has increased over time in most metropolitan areas. In addition, there are short-term causes of congestion as well, such as crashes, construction projects, inclement weather, and special events (21).

As noted at the outset, traffic congestion is widely assumed to exact a toll on the performance of regional economies. According to a recent study, traffic congestion imposed a cost to the U.S. economy of $124 billion in 2013, or around 0.8% of total gross domestic product (GDP) (22). Previously, some have estimated traffic congestion to generate a cost as high as 2-3% of GDP per annum (23). Furthermore, the cost to the economy from traffic congestion is believed to have increased over time. According to Schrank, Lomax and Turner (24) the cost of
time delay to the U.S. economy increased from $24 billion in 1982 to $115 billion in 2009 (in 2009 $).

These estimates typically measure what Sweet (4) refers to as the first-order impact of traffic congestion. First-order effects refer to the immediate costs imposed to road users by time delay generated on transportation networks. There are typically two types of first-order costs: (a) nonproductive travel delay and (b) unreliable travel times. Beyond challenges in defining the value of time, the true cost of congestion, as seen though such a lens, is difficult to determine since it is not clear whether time spent in traffic is “unproductive,” and therefore represents some form of opportunity cost (4).

Sweet (4) also identifies second-order congestion effects, which are the primary concern of the analysis reported here. Second-order effects refer to longer-term costs to economic productivity and growth that are induced by traffic congestion. If the diseconomies of scale to which congestion gives rise increase to the extent that they outweigh the benefits from agglomeration (which are in essence the production advantages of cities) – productivity declines, and economic activity will tend to relocate to other parts of the region, or perhaps to another region. Limited evidence suggests that traffic congestion is a drag on employment and productivity growth across metropolitan regions (3; 7).

Access
Accessibility is a popular and variously defined term that centers on the ability of travelers to avail themselves of economic and social opportunities in space (25). Often contrasted with mobility (which is a “means” of access often paired with proximity), access is considered an “end” of travel, wherein the scope and scale of economic and social opportunities differ from one place to another. Mondschein et al. (26) found that in Los Angeles and Orange Counties some neighborhoods are better “congestion-adapted” than others, since they host higher levels of individual activity participation in spite of relatively large traffic delays. This is because in some places, less vehicle travel (due to short travel distances, and ease of walking, biking, and transit travel) is required to access an equivalent range of opportunities ceteris paribus.

The Transportation Network and Economic Performance
Transportation networks play a vital role in economic performance since they facilitate interaction among key economic actors – most notably, people and firms – within and across regional economies. Within regional economies, the emergence of streetcars and various forms of rail infrastructure were a major contributing factor to the rise of central business districts and the growth of cities in the late nineteenth century (27). Such infrastructure enabled the development of residential neighborhoods further from central business districts than had previously been possible. To this extent, transportation systems determine the extent of labor markets (since they enable more people, at greater distances, to access employment) and enable cities to expand in size (28). Since the size of cities is strongly correlated with productivity and economic prosperity (29; 30), transportation networks play a crucial role in shaping regional prosperity.

Agglomeration Economies
There are two key features of economic geography: concentration and specialization. These concepts are key to the formal economic models of agglomeration economies (18). The transportation network, along with the concept of increasing returns, is central to this theory.
Cities are expensive places; why do people and firms crowd into them? Land is scarce and expensive (30), and negative externalities like traffic congestion and air pollution are commonplace. To endure such diseconomies of agglomeration, people and firms must receive some offsetting benefit from locating in cities, which are known as increasing returns to production (18; 31).

When increasing returns are present, the level of output generated per unit of input increases with the scale of production. If transportation costs are high the economic benefits of clustering can evaporate. As transportation costs fall, however, inter-regional trade emerges (18). Due to increasing returns, it is cheaper and more efficient to produce the goods and services of some (tradable) industries in one, or very few places, and then transport them to markets around the world, than it is for each place around the world to produce a full range of goods and services locally (32).

There is mounting evidence that the benefits from agglomeration attenuate over relatively short distances (15-17). A study of the software industry, for example, found that adding 100 employees within one mile of a zip code is associated with 10 times more new establishments than adding the same level of employment from between one and five miles away (15). Since localization economies attenuate within regional economies over much shorter distances than previously thought, local transportation networks are critical to regional prosperity not just by moving workers, goods, and consumers, but by facilitating inter-firm agglomeration economies as well. Transportation networks thus shape supplier relationships by enhancing firm-to-firm interactions in addition to connecting labor markets with employment (27; 28).

Despite the extensive evidence on the economic benefits of clustering, and the well-developed theory regarding the central role of transportation networks (and their delays) on increasing returns, we can find no previous empirical studies of how transportation network delays affect the establishment of new firms. Conversely, in the literature on accessibility and traffic congestion, there have been few studies that examine directly the relationship between congestion-modified access and effects on economic activity at sub-regional scales. So it is to this issue that we now turn.

**DATA AND METHODS**

**Data**

This research draws from three primary datasets: the National Establishment Time Series (NETS), transportation network travel time data developed by the Southern California Association of Governments (SCAG), and socio-demographic data from the U.S. Census Bureau’s American Community Survey (ACS). NETS is a proprietary micro dataset released by Walls and Associates and comprised of Duns Market Information business directory data (DMI). NETS tracks the “birth” and “death” of each establishment in the U.S. since 1990. Over the life of an establishment, the dataset contains records on the employment level and street address of each establishment for each year, so that births, deaths, and relocations can be tracked. We geocoded each commercial establishment in Southern California (except for those in San Diego and Imperial Counties) for 2008 and 2009, using a combination of Data Science Tool Kit and Nokia application program interfaces (APIs). The SCAG transportation network travel time data measure traffic analysis zone-to-zone distances and travel times for 2008. The ACS sociodemographic data provide population estimates averaged over the years 2005 through 2009.
at the census tract level, from which we spatially interpolated figures at the closely matched traffic analysis zone level.

Establishments Data
The data analysis for this article focuses on two primary industries, entertainment and IT, while a third “non-basic” industry, supermarkets and groceries, is analyzed for comparison. Each industry is defined using the North American Industrial Classification System (NAICS). The IT industry is comprised of four sub-sectors: semiconductors (NAICS codes 333295 and 33451); electrical components (3344); computer and communications hardware (3341 and 3342) and software (518 and 5415). The entertainment industry is primarily comprised of two sub-sectors: the motion picture and video industry (5121) and the sound recording industry (5122). Supermarkets and grocery stores are defined by NAICS code 4451.

Metropolitan Los Angeles is comprised of five (Los Angeles, Orange, Riverside, San Bernardino and Ventura) counties, as defined by the federal government’s Office of Management and Budget, which officially refers to the region as the Los Angeles-Long Beach Combined Statistical Area (CSA). In 2010, the population of the region was estimated to be 17.8 million people, while in 2008, approximately 9 million people were employed in the region. Los Angeles County is the most populous county in the region (and the nation). In 2008, the county’s population stood at 9.8 million people, while the region’s second largest county, Orange, had a population of 3 million people.

As noted above, the entertainment and IT industries are income generators for the regional economy. In 2008, 155,000 people were employed in the entertainment industry in the region, which is around 1.4 percent of the region’s total; nationally the industry accounted for less than a fifth of one percent of total employment. While many readers might be surprised by how few people are employed in “Tinseltown,” the Los Angeles region accounted for fully half of the nation’s total entertainment industry employment in 2008. In 2008, 318,000 people were employed in the IT industry (3.5% of the region’s total, compared with 2.4 percent of national employment). The IT industry in greater Los Angeles, by comparison, accounted for 5 percent of the nation’s IT jobs. While there are actually more IT than entertainment jobs in Los Angeles, the entertainment industry is much more localized nationally than is the case for the IT industry. Both are relatively high-paying industries. In 2008, the entertainment industry in the region paid an average wage of $90,223, while in the IT industry the average wage was $84,972. These figures compared to a region-wide average wage of $49,052 across all industries at this time.

The maps in Figure 1 display the different spatial patterns of the entertainment, IT, and grocery industries in metropolitan Los Angeles. The entertainment industry is highly concentrated within two parts of Los Angeles County (separated by the Santa Monica mountains). The IT industry, by contrast, is comprised of a series of smaller clusters dispersed throughout the region, in part a legacy of the region’s earlier albeit now faded global leadership in aerospace. As we would expect, grocery stores are scattered throughout the region and do not display a high degree of clustering.
FIGURE 1 New Firms and All Employment in Three Sectors: Entertainment, IT, and Groceries
New Establishments

There is a large body of research on the location of new business establishments (16; 17; 33; 34). This business location research typically measures the effect of three types of factors on the pattern of new business establishments: (1) agglomeration economies, (2) factors of production costs (such as wages and land), and (3) government actions such as tax rates, public safety, and land use. This literature has been largely silent on the role that congestion plays in determining the location of business activity within regions. When the impact of congestion has been tested, crude measures have been employed to proxy for road delay, such as employment and population density or network distance between different locations (11).

Nearly all of the research discussed earlier on the effect of agglomeration economies on the location of new business establishments has relied almost exclusively on Euclidian or straight-line distances among firms, ignoring both traffic delays and the circuituous nature of some transportation networks (15-17). We correct for this by replacing simple straight line measures with actual transportation network data, including average peak period congestion levels. The analysis reported here improves substantially on previous clustering measures.

Transportation Data

The transportation network and traffic data for the study are taken from SCAG’s 2008 regional travel model. The model includes traffic analysis zone-to-zone (TAZ) distances and travel times for the base year of the model, 2008, with distances and speeds estimated and calibrated to conform to empirical speed data collected for the region. SCAG develops matrices of estimated vehicle travel times and speeds among TAZs for both peak (AM and PM) and off-peak travel periods. In this analysis, however, we do not focus on the differential between peak and off-peak speeds, but on the effects of peak “congested” speeds relative to proximity on establishment behavior. We argue that speeds during peak periods establish the accessibility context for firms co-location decisions, and examine in the models how speed during busy commuting hours does or does not influence firm choices.

Model

For the most part, business location modeling relies on a utility maximization framework where business location is framed as a discrete choice problem in which profit (utility) maximizing firms decide to locate in one site from a set of alternative locations (33). Today, modeling business location decisions, for the most part, relies on count models, such as the Poisson or negative binomial (NB) models, which are both derived from the Poisson distribution (17; 33; 34).

The Poisson distribution is used to model events that occur infrequently, which are typically non-linear in nature. The negative binomial model is often preferred to the Poisson model in business location modeling since it overcomes several problematic assumptions of the Poisson model such as, for example, the assumption that the conditional mean of an outcome is equal to the conditional variance (known as equidispersion). Negative binomial models, by contrast, allow for distributions that are over-dispersed. In cases where there is a large number of zeros (for example, a large number of zones with no new firms), a zero-inflated negative binomial model is preferred. The zero-inflated model adds an additional modeling component to account for an observed number of zeros that exceeds what would be expected from the best fitting negative binomial distribution. Such an excess of zeroes may arise due to the impossibility for enterprises to locate in particular places (because of zoning constraints, for example) or
Osman, Thomas, Mondschein, and Taylor

because new establishments determine that the characteristics of some sites would not enable
them to maximize their profits (perhaps due to relative remoteness within a region).

The models presented below seek to reveal why new entertainment, IT and grocery
establishments locate where they do within Los Angeles. Within the region, the choice set faced
by a new establishment is represented by traffic analysis zones (TAZ), which roughly
approximate census tracts. There are 4,109 TAZs in the region, with a median size of 1.73
kilometers squared. The dependent variables in this analysis are, respectively, the number of
entertainment, grocery and IT establishments that choose to locate in a given TAZ in the year
2009. There are three groups of independent variables. The first are measures of same industry
activity from each TAZ; these were calculated at network distance thresholds of 5, 5-10, 10-20,
20-30 and 30-45 kilometers, for the respective industries. These variables are used to test at what
scale the level of same industry employment is a significant predictor of the location of a new
establishment in a given TAZ for each industry. A measure of congestion is also included in the
models. For each of five network distance thresholds (5, 10, 20, 30 and 45 km), the average
speed from each TAZ to every other TAZ was calculated for the AM peak commute period.
Finally, controls for zonal income, race/ethnicity breakdown, and overall population are included
for each TAZ. The level of employment and population in a given TAZ were used to measure the
zero-inflation term. To reduce problems of endogeneity, each independent variable was lagged
by one year. Therefore, the decision to locate at a given site is based on congestion levels from a
prior period. Theory would predict that new entertainment and IT establishments would locate in
close proximity to existing levels of activity for the respective industries within the region.
Grocery stores should not display agglomerative behavior at a regional scale (though they might
locally due to land use regulations). If congestion acts as a diseconomy of scale, firms should
locate in those parts of the region where congestion is relatively low and avoid those locations
where it is very high.

RESULTS

The Entertainment Industry

Table 1 below displays the model output for the entertainment industry. The coefficients of the
variables have been standardized so that the effect of each variable can be directly compared.
Five iterations of the model were executed. Across each iteration, the speed variable indicates
average speeds across an increasingly large distance radius from a given TAZ. The model output
reveals that new entertainment establishments tend to locate near existing entertainment
establishments (as measured by employment), with a 99 percent level of confidence. As
expected, the effect of existing entertainment activity on the location of new ones decays with
distance. For example, existing entertainment employment levels within 20 kilometers of a given
TAZ are a better predictor (by roughly two-thirds) than if the entertainment activity is between
30 and 45 kilometers away. This finding is consistent with existing research that shows that new
establishments in basic industries seek to locate close to similar activity within regional
economies (15; 17).

The average speed at which one can travel from one TAZ to all other TAZs within a 5 km
range has an insignificant bearing on the location of new entertainment establishments within the
region. However, the speed to access other TAZs over a range of 5-20 km is a significant
predictor of new entertainment establishments within the region, with a 95% level of confidence;
as speed increases over this range, the number of new establishments in a given TAZ also
increases. The speed to access TAZs within a 30-45 kilometer range of a given TAZ is not a
significant predictor of the location of new entertainment establishments. These relatively longer
distance threshold effects may reflect the logistics of inter-firm linkages as well as access to
specialized labor markets.

Across each of the models, the percentage of Hispanic residents in a given TAZ is a
strong negative predictor of new entertainment establishments, while more prosperous and
populous TAZs show a high propensity to be home to new entertainment establishments, all else
equal.
TABLE 1 Predictors of New Entertainment Establishments in Los Angeles, 2009*

<table>
<thead>
<tr>
<th>Entertainment Start Ups 2009</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
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<tbody>
<tr>
<td>All Entertainment employment (2008) within 5 km</td>
<td>0.293</td>
<td>0.294</td>
<td>0.300</td>
<td>0.294</td>
<td>0.292</td>
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<tr>
<td></td>
<td>(9.86)</td>
<td>(9.96)</td>
<td>(10.32)</td>
<td>(9.95)</td>
<td>(9.80)</td>
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<tr>
<td>All Entertainment employment (2008) within 5-10 km</td>
<td>0.297</td>
<td>0.313</td>
<td>0.311</td>
<td>0.295</td>
<td>0.290</td>
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<tr>
<td></td>
<td>(9.68)</td>
<td>(9.93)</td>
<td>(10.18)</td>
<td>(9.67)</td>
<td>(9.53)</td>
</tr>
<tr>
<td>All Entertainment employment (2008) within 10-20 km</td>
<td>0.341</td>
<td>0.369</td>
<td>0.389</td>
<td>0.338</td>
<td>0.321</td>
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<td></td>
<td>(7.73)</td>
<td>(8.11)</td>
<td>(8.33)</td>
<td>(7.46)</td>
<td>(7.42)</td>
</tr>
<tr>
<td>All Entertainment employment (2008) within 20-30 km</td>
<td>0.235</td>
<td>0.254</td>
<td>0.264</td>
<td>0.233</td>
<td>0.224</td>
</tr>
<tr>
<td></td>
<td>(5.94)</td>
<td>(6.28)</td>
<td>(6.48)</td>
<td>(5.84)</td>
<td>(5.69)</td>
</tr>
<tr>
<td>All Entertainment employment (2008) within 30-45 km</td>
<td>0.189</td>
<td>0.211</td>
<td>0.232</td>
<td>0.196</td>
<td>0.181</td>
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<td></td>
<td>(4.56)</td>
<td>(4.95)</td>
<td>(5.24)</td>
<td>(4.40)</td>
<td>(3.98)</td>
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<tr>
<td>All employment (2008) within 5 km</td>
<td>-0.028</td>
<td>-0.025</td>
<td>-0.047</td>
<td>-0.050</td>
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<td></td>
<td>(-0.63)</td>
<td>(-0.56)</td>
<td>(-1.09)</td>
<td>(-1.13)</td>
<td>(-1.01)</td>
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<td>Average Peak Hour Speed 5 km threshold</td>
<td>0.082</td>
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<tr>
<td></td>
<td>(1.37)</td>
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<td>Average Peak Hour Speed 10 km threshold</td>
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<td>(3.10)</td>
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<td>-</td>
<td>(1.07)</td>
<td>-</td>
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<tr>
<td>Average Peak Hour Speed 45 km threshold</td>
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<td>-</td>
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<td>-</td>
<td>0.016</td>
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<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(0.27)</td>
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<td>Median income 2005-09</td>
<td>0.152</td>
<td>0.165</td>
<td>0.175</td>
<td>0.154</td>
<td>0.148</td>
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<td></td>
<td>(3.56)</td>
<td>(3.85)</td>
<td>(4.07)</td>
<td>(3.58)</td>
<td>(3.44)</td>
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<tr>
<td>Percent Hispanic 2005-09</td>
<td>-1.078</td>
<td>-1.057</td>
<td>-1.037</td>
<td>-1.068</td>
<td>-1.080</td>
</tr>
<tr>
<td></td>
<td>(-12.93)</td>
<td>(-12.64)</td>
<td>(-12.34)</td>
<td>(-12.63)</td>
<td>(-12.76)</td>
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<td>Population 2005-09</td>
<td>0.907</td>
<td>0.889</td>
<td>0.876</td>
<td>0.900</td>
<td>0.910</td>
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<tr>
<td></td>
<td>(10.29)</td>
<td>(10.04)</td>
<td>(9.85)</td>
<td>(10.10)</td>
<td>(10.23)</td>
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<td>AIC</td>
<td>1.476</td>
<td>1.475</td>
<td>1.474</td>
<td>1.476</td>
<td>1.476</td>
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<td>BIC</td>
<td>-26802.865</td>
<td>-26807.33</td>
<td>-26810.654</td>
<td>-26802.125</td>
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<tr>
<td>Log Likelihood</td>
<td>-2901.639</td>
<td>-2899.407</td>
<td>-2897.745</td>
<td>-2902.009</td>
<td>-2902.542</td>
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</tbody>
</table>

*Z*-scores are in parentheses.

- = missing data
The IT Industry

Table 2 below shows the predictors of new IT establishments in Los Angeles in 2009, which vary considerably from the predictors of new entertainment establishments. While new IT establishments seek to locate proximate to existing levels of IT activity within the region, the effect of such proximity is restricted to a range of 5 kilometers. The level of IT activity within 5 km of a TAZ predicts the location of new IT starts with a 99 percent level of confidence, but the effect of IT activity at other ranges (except for 20-30 km) is insignificant, all else equal.
For the IT industry, speed is not a significant predictor of the location of new IT establishments, across any distance threshold. As is the case with the entertainment industry, the share of Hispanic residents in a given TAZ is a negative predictor of new IT establishments,
while wealthier and more populous TAZs display a higher propensity to be home to new IT
establishments, all else constant.

**Grocery Stores**
Table 3 displays output relating to the predictors of new grocery store locations. Unlike
entertainment and IT, grocery stores are not thought to be subject to the clustering benefits of
basic industry agglomeration; store locations instead center on customer access. Not surprisingly,
the proximity and speed variables are not significant in these models. This “null” case provides a
measure of robustness to the proximity findings in the other models.
## Table 3 Predictors of New Grocery Establishments in Los Angeles, 2009a

<table>
<thead>
<tr>
<th>Grocery Stores Start Ups 2009</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Grocery Stores employment (2008) within 5 km</td>
<td>0.034</td>
<td>0.041</td>
<td>0.026</td>
<td>0.025</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(0.60)</td>
<td>(0.72)</td>
<td>(0.46)</td>
<td>(0.46)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>All Grocery Stores employment (2008) within 5-10 km</td>
<td>0.003</td>
<td>0.009</td>
<td>-0.003</td>
<td>-0.003</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.12)</td>
<td>(-0.03)</td>
<td>(-0.04)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>All Grocery Stores employment (2008) within 10-20 km</td>
<td>-0.142</td>
<td>-0.134</td>
<td>-0.152</td>
<td>-0.152</td>
<td>-0.148</td>
</tr>
<tr>
<td></td>
<td>(-1.45)</td>
<td>(-1.36)</td>
<td>(-1.54)</td>
<td>(-1.55)</td>
<td>(-1.51)</td>
</tr>
<tr>
<td>All Grocery Stores employment (2008) within 20-30 km</td>
<td>0.144</td>
<td>0.155</td>
<td>0.132</td>
<td>0.129</td>
<td>0.130</td>
</tr>
<tr>
<td></td>
<td>(1.40)</td>
<td>(1.50)</td>
<td>(1.29)</td>
<td>(1.26)</td>
<td>(1.28)</td>
</tr>
<tr>
<td>All Grocery Stores employment (2008) within 30-45 km</td>
<td>-0.017</td>
<td>-0.009</td>
<td>-0.031</td>
<td>-0.055</td>
<td>-0.101</td>
</tr>
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<td></td>
<td>(-0.20)</td>
<td>(-0.11)</td>
<td>(-0.36)</td>
<td>(-0.61)</td>
<td>(-1.06)</td>
</tr>
<tr>
<td>All employment (2008) within 5 km</td>
<td>0.044</td>
<td>0.042</td>
<td>0.044</td>
<td>0.045</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>(1.14)</td>
<td>(1.11)</td>
<td>(1.16)</td>
<td>(1.19)</td>
<td>(1.20)</td>
</tr>
<tr>
<td>Average Peak Hour Speed 5 km threshold</td>
<td>0.020</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Average Peak Hour Speed 10 km threshold</td>
<td>-</td>
<td>0.063</td>
<td>-</td>
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<td></td>
<td>-</td>
<td>(0.76)</td>
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<tr>
<td>Average Peak Hour Speed 20 km threshold</td>
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<td>-</td>
<td>-0.042</td>
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<tr>
<td></td>
<td>-</td>
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<td>(-0.49)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Average Peak Hour Speed 30 km threshold</td>
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<td>-0.077</td>
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<td>(-1.02)</td>
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<tr>
<td>Average Peak Hour Speed 45 km threshold</td>
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<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(-1.76)</td>
</tr>
<tr>
<td>Median income 2005-09</td>
<td>-0.041</td>
<td>-0.041</td>
<td>-0.043</td>
<td>-0.042</td>
<td>-0.042</td>
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<tr>
<td></td>
<td>(-0.69)</td>
<td>(-0.68)</td>
<td>(-0.72)</td>
<td>(-0.72)</td>
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<tr>
<td>Percent Hispanic 2005-09</td>
<td>-0.047</td>
<td>-0.046</td>
<td>-0.049</td>
<td>-0.049</td>
<td>-0.047</td>
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<tr>
<td></td>
<td>(-0.61)</td>
<td>(-0.59)</td>
<td>(-0.63)</td>
<td>(-0.63)</td>
<td>(-0.60)</td>
</tr>
<tr>
<td>Population 2005-09</td>
<td>0.076</td>
<td>0.073</td>
<td>0.079</td>
<td>0.078</td>
<td>0.072</td>
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<tr>
<td></td>
<td>(1.08)</td>
<td>(1.04)</td>
<td>(1.13)</td>
<td>(1.11)</td>
<td>(1.04)</td>
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<tr>
<td>AIC</td>
<td>0.929</td>
<td>0.929</td>
<td>0.929</td>
<td>0.929</td>
<td>0.928</td>
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<tr>
<td>BIC</td>
<td>-28965.55</td>
<td>-28966.037</td>
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<tr>
<td>Log Likelihood</td>
<td>-1820.297</td>
<td>-1820.053</td>
<td>-1820.217</td>
<td>-1819.819</td>
<td>-1818.794</td>
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</tr>
</tbody>
</table>

a Z-scores are in parentheses.
- = missing data
Across the two basic industries analyzed here, we observe clear differences in proximity and speed effects on the location of new establishments. For the entertainment industry, the speed at which a traveler in one TAZ can access other zones was a significant predictor of the location of new establishments over a range of 5-20 kilometers, but not within 5 kilometers or beyond 20 kilometers. These findings suggest that new entertainment establishments (at least those formed in 2009) are somewhat indifferent to localized congestion levels over relatively short distances (less than 5 kilometers), but do tend to locate in areas where average speeds in buffers of 5 to 20 kilometers are higher.

This finding is in marked contrast to the IT industry, where speed over any range is not a significant predictor of new establishments, but proximity is. The distinct differences in the geography of the two industries in Southern California likely explain the divergent findings.

Since the level of IT activity beyond 5 kilometers is not a significant predictor of new IT establishments, the speed at which new IT establishments can access similar activity at these distances may be irrelevant. By contrast, the level of entertainment activity predicts the location of new entrainment establishments over greater distances. This perhaps explains why the speed of access over this range is a significant predictor of new firms.

These findings suggest that the way that congestion, in terms of the ongoing impedances it creates between places, impacts the performance of industries depends on the geography and structure of individual industries within regional economies. For those industries that are highly localized in space, such proximity may outweigh any congestion effects. This seems to be the case in the IT industry in Los Angeles, which is divided into a series of small clusters throughout the region. However, the larger a cluster grows, in mass and in space, which is a function of land use and density, the more critical congestion effects become. The entertainment industry is focused around Los Angeles’ west side and Hollywood, but the cluster is so large that firms still must traverse very significant distances to interact with other firms cluster-wide. In this case, access to high-speed parts of the cluster, such as near freeways, may be advantageous for new firms.

CONCLUSION

For the two basic industry start-ups analyzed, traffic congestion (as measured by the speed of interaction across the regional economy) has less effect on predicting the location of start-ups than proximity, and by extension, accessibility. That said, there were key differences in the relationship between speed and the location of new establishments across the industries of interest. For the entertainment industry, congestion appears to have a negative effect on new start-up firms over a 5 to 20 kilometer threshold. Neither localized congestion, nor delays beyond 20 kilometers appear to effect start-ups in LA’s most glamorous industry. In the IT industry, proximity over very short distances (less than 5km) are significant predictors of start-up locations, but neither the location of more distant IT firms nor local, sub-regional, or regional traffic congestion have any statistically significant effect on startups.

Ultimately, our examination of these two basic industries, along with grocery stores, suggests that while region-wide claims about the effect of traffic congestion on economic activity may have merit in the aggregate, it is more likely the case that accessibility is distinctively different among industries. The particular combinations of speed and proximity that supply the best conditions for agglomerative growth will vary depending on a wide range of
factors, including labor markets, intra-firm dependencies, and – in Hollywood – the wherewithal to see and be seen. This analysis signals that economic geographers can do more to incorporate speed into their analysis, and transportation researchers and planners should account for proximity as well as congestion when evaluating the transportation network’s effects on economic activity.
REFERENCES


