ITLS

WORKING PAPER

ITLS-WP-18-11

Firm-specific and location-specific drivers of business location and relocation decisions

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June 2018

INSTITUTE of TRANSPORT and LOGISTICS STUDIES

The Australian Key Centre in

Transport and Logistics Management

The University of Sydney

Established under the Australian Research Council's Key Centre Program.

NUMBER:	Working Paper ITLS-WP-18-11

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ABSTRACT: Decisions made by businesses on where to locate or relocate are typically given less consideration than residential location in integrated transport and land use modelling systems. This is surprising given the important role that businesses play in defining employment opportunities, and hence the travel patterns of workers and any travel associated with accessing firms. As part of a larger study on giving firm location choices an endogenous representation in an integrated model system, this paper reviews the existing literature on the drivers of location and relocation decisions in various geographical jurisdictions. The findings provide a starting position in the design of future firm-specific surveys and especially the attributes that are candidates for stated choice experiments and for inclusion in firm location utility equations embedded in integrated strategic model systems.

KEY WORDS: *business location, relocation, literature review, geographical settings, keys drivers of location decisions, decision maker*

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DATE: June 2018

1   Introduction

The suite of modelling systems used to forecast passenger and freight travel demand typically assume that the location of firms is fixed and that job opportunities are defined by the existing mix of job types, assumed to grow over time at an exogenously defined constant rate applied to all or some jobs and all locations in metropolitan areas. Developments in travel demand modelling such as the MetroScan system (Hensher, Ho, et al., 2017) have improved the way in which workplace (and non-workplace) location choices are related to residential location and travel-related choices; however the application of such model systems to forecast the long run impact of investment in major new road and public transport infrastructure is only able to establish the likely spatial redistribution of the number of jobs, holding the number of firms fixed.

Real market responses show that there will be adjustments in the job opportunities by location (through existing firm relocation and entry of new firms) in the presence of major improvements in accessibility; however, existing integrated citywide travel and location modelling systems, with rare exception (for example, Eric Miller's ILUTE Chingcuanco & Miller, 2018; Elgar, Miller, & Farooq, 2008; Hensher, Teye, Ellison, & Ho, 2017) fail to take into account how firms might respond in respect of location and relocation choices, which has significant implications on the number of new jobs created (i.e., inducement) or existing jobs re-located (i.e., spatial redistribution). This denies the real possibility of economic growth responses in respect of both the spatial distribution of the total number and composition of jobs. In addition to providing an enabling mechanism to support economic growth through cost savings and agglomeration benefits for business, both important sources of productivity growth, improved accessibility can also have a significant influence on the containment of travel (passenger and freight) if appropriate incentives are in place from government and industry as well as other entrepreneurial initiatives.

The literature suggests that there is a clear distinction between factors affecting the choice of the 'initial' and 'readjusted' location (see Figure 1). It is arguable, however, that firms that are locating for the first time have significantly different preferences than those of relocating firms (Elgar et al. 2015). The *initial choice* of urban location is not necessarily optimal, that is, urban development can occur simultaneously in different *loci* (A, B, C, . . .), despite their initial location advantages or disadvantages (Portnov & Schwartz, 2008). However, eventually, *objective location differences* between places (e.g., proximity to major population centres, climatic differences, the availability of land for new development, or access to market opportunities elsewhere) are likely to drive economic development and economically strong households and businesses to places with location advantages (A) and away from less favourable ones (B, C). As this 'readjustment' occurs, *additional resources* might become available in favourable locations, helping to enhance *location advantages* (e.g., transportation nodes, unique urban functions, business connectedness in supply chains etc.), or to *minimise local hindrances* (e.g., improve connectivity).
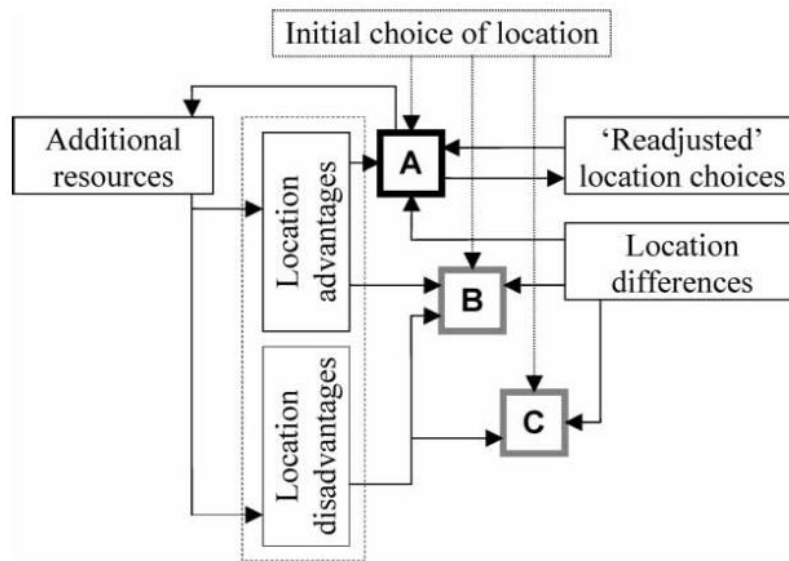
Figure 1: Location choice contexts
Source: Portnov & Schwartz (2008)

This paper reviews the literature on business location decisions in order to identify the main drivers that are proposed as influences on firm location and re-location decisions (including the decision to stay put), as well as who is involved in advising and/or making such decisions. We then suggest a way forward in deciding which reported influences are well positioned for incorporation in a choice experiment and what additional contextual data needs to be collected. Structurally, a model system will be required that can be used to obtain estimates of the probability of a firm locating in a particular spatial jurisdiction, and whether a firm would relocate to another spatial setting or stay put under specific circumstances associated with internal drivers at the firm level and the local external environment.

The paper is structured as follows. We begin with a review of the drivers of business[1] location decisions offered in the current literature. We then focus on the decision-maker and their influence on how location decisions are made. This is followed by a discussion of the different approaches used to study business location decisions. The concluding section summarises the main findings and suggestions on the attributes to include in a stated choice experiment designed to investigate preferences (and willingness to pay) for particular drivers of location choices. We also comment on the challenges in collecting data from firms.

2 Business location decision contexts

2.1 Business location motivation and approaches

Business location decisions can be divided into location or re-location settings depending on when they occur in the life cycle of a business. Location decisions refers to searching for a location for the first time (for example, a new company or a company where the employees worked remotely

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[1] We used the words business, firm, organisation, company, and plant as equivalent unless stated otherwise.

previously). Re-location is associated with circumstances where a company is looking to change their current location.

There are, however, notable degrees of grey in the interpretation. For example, van Dijk & Pellenbarg (2017) describe several cases where a firm searches for a new location which is not their first time location or a re-location *per se;* for example when only a section of the firm is moved to another location. This is referred to as partial migration, and includes situations where two companies merge and move to a new location. Elgar, Farooq, & Miller (2009) distinguish between new and re-locating firms. What we see in the literature are many cases that are difficult to label as an unambiguous agreed definition of the firm location decision. This distinction is analogous to the approaches adopted in studying vehicle purchases where a distinction is made between a history approach and a transactions approach (see Hensher, Smith, Milthorpe, & Barnard, 1992 for a discussion). The history approach has dominated the automobile literature, providing a preferred setting in which to both study all auto stock and adjustments in stock over time (the latter equivalent to transacting). Likewise in the current context, the literature emphasises in the main the history approach through location and re-location as an adjustment in the location stock. The great majority of the literature is location focussed at on a period in time.

The broader literature emphasises some very specific classes of drivers underlying the location (and re-location) decisions. Specifically, Decker & Crompton (1993) in the context of high technology, research and development, services and headquarters industries, define two types of location-related decisions: (1) tangible and quantifiable decisions (e.g., to expand capacity, reduce operating costs), and (2) less tangible decisions (e.g., improving employees' quality of life, or improving a company's image). Kimelberg (2014) also differentiate two types of motives associated with location decisions: (1) the need to minimise operating costs, and (2) the need to secure an appropriate workforce and to leverage opportunities for collaboration and innovation (essentially the agglomeration argument - see also Hensher, Truong, Mulley, & Ellison (2012). This study uses a qualitative assessment approach across many types of companies and industries that are looking to be closer to upstream and downstream markets in their supply chain. Kimelberg criticises the business location literature for overlooking the importance of motive in theory development and as a means to inform sensible economic development policies and strategies.

Bagchi-Sen & Hayter (2001) distinguish three theoretical literatures at the centre of location decisions: the neo-classical, behavioural, and institutional approaches. The neo-classical approach assumes that the decision to move is based on cost minimisation or profit maximisation (promoted in Kimelberg, 2014). The behavioural approach assumes that there is limited information and bounded rationality, and considers economic and other factors as important in location decisions, with the decision-maker(s) behaving as a 'satisfiser'. The institutional approach developed more recently in the 1990s, questions the other two theoretical paradigms which consider that the environment of the firm is aspatial. Instead, the institutional approach argues that the social and cultural context of the firm influences their decisions, and that a spatial dimension is fundamental to the outcome. These papers provide a setting in which we will seek out the candidate drivers that appear to provide a broad-based support for specific location decisions.

2.2 Local/Regional, International or Global Re-location

(van Dijk & Pellenbarg (2017) summarise (reproduced as *Table 1*) the relationship between the type of location decision and the spatial scale: Local/regional, International, and Global. This distinction is important in establishing the geographical boundaries for empirical research, with the possibility that there is a hierarchical structure used in the search process: the local/regional scale typically refers to location and relocation decisions that involve consideration of options in the same region or the same country; in contrast international refers to cross borders options (often in the same continent), and global often is used when considering more than one continent. In the following section we investigate the drivers that have been used in making location decisions in all of these jurisdictions.

Table 1: Firm migration and Spatial Scale. Source: van Dijk & Pellenbarg (2017)

Type of move	Spatial Scale		
	Local/regional	International	Global
Integral migration	SME moves within countries		
Partial migration	SME subsidiaries within countries	SME cross-border moves	TNC and SME moves from west to east, or from north to south, in Europe, America and Asia	
Bran plants and joint ventures		SME and TNC cross-border moves	TNC and SME moves from west to east, or from north to south, in Europe, America and Asia	FDI and TNCs from Europe or USA to Asia
Contracting out				International purchase of goods and services

FDI = foreign direct investment; SME = small and medium-sized enterprises; TNC = transnational corporation

3 Key drivers

The growing literature focussed on studying business location decision suggests that key drivers can be classified into two main categories: *push* factors and *pull* factors (Pellenbarg, Van Wissen, & Van Dijk, 2002). The *push* factors refer to the current situation of a firm and, thus, motivates the company to move; the *pull* factors refer to those characteristics of a new (or first) location, which are attractive for a company. Some drivers refer to internal factors of a business, such as its size or efficiency, and some are external, such as neighbourhood characteristics and accessibility. In the following overview of a number of the key studies we have identified from disparate disciplines, we draw out of the empirical evidence, given the focus of the research, the main drivers that contribute to understanding business location and re-location decisions. The findings are grouped by spatial focus; that is local or regional, and international/global. Table 2 summarises the main drivers by spatial context for several studies; to be discussed below with more detail in Appendix A.

Table 2: Summary of main drivers for business location decisions in the current literature

Spatial Context	Reference	Key Variables		Country	Years of data	Analysis Method
		Dependent	**Explanatory variables**[2]			
Local/Regional Business Location Decisions	Van Dijk & Pellenbarg (2000)	Stated probability of moving in the next few years	(1) Industry sectors: Retail and hotels, restaurants, cafes (-); Non-commercial sector (+) (2) Firm size (-) (3) Firms at city border (+) (4) Site used for heavy industry (-) (5) Firm that own the building (-) (6) Location tension (+) (7) Need for revitalisation (+) (8) Firms located in certain provinces (±)	Netherlands	1995-1996	Ordered logit
	Risselada & Schutjens (2012)	Relative importance of real estate factors	(1) Firm characteristics: age (-); if it is in the sector of industry, transport, wholesale and car repair (+); no previous location (-); previous location was home (-); dummy variables for working more than half of the time at the business property (+), and if the business property is a place for direct contact with business relations (+) (2) Neighbourhood characteristics: percent of welfare recipients (+), percent of private owned housing (-), percent of non-western migrants (+), and property value (+)	Netherlands	2011	Ordinary Least Squares regression model
	Bodenmann (2011); Bodenmann & Axhausen (2012)	Firm new location at a municipality-level. They consider companies that are relocating only	(1) Factors of production: residuals for commerce and industry (-); land price (-) and residuals for residential use (-); degree of land use in building zones (-); population with graduate degrees (+) (2) Business environment: the municipality is a large or intermediate city (+); rate of employees within the same sector (+); index of diversity of sectors (+)	Sweden	1991-2006	Nested Logit

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[2] The (+) sign represents a positive influence on the dependent variable; (-) sign represents a negative influence; and (±) sign represents some positive and some negative effects (it is used only once to represent a positive effect of some locations, and a negative of others).

Spatial Context	Reference	Key Variables		Country	Years of data	Analysis Method
		Dependent	Explanatory variables[2]			
			(3) Governmental environment: tax burden for partnerships (-); for joint stock companies (-); for holding companies (-); if the municipality has a motorway connection (-) and if it has a rail station (-); accessibility of employees (+); duration of building licence application process (-); cantonal business development (+) (4) Geographical aspects: distance to the previous site (-)			
	Backman & Karlsson (2017)	New firm location at a municipality-level. They consider individuals that used to work in a company and now are starting their own business	The alternatives are: build the start up in the residential location; previous work location; or in other location. The influence of each of these variables in each alternative is explained in the text. (1) Commuting behaviour: if the individual commuted to his previous work location within the labour market (short distance) or outside it (long distance); if the individual has lived in the municipality for the past five years; if the individual has commuted in the past ten years; number of years the individual has commuted; if the individual has commuted to a more urban municipality (2) Other: education type, education length, experience, occupation, gender, if the individual is born outside Sweden, density of the municipality of residence, and the competition level in the municipality of work and residence.	Sweden	2007	Multinomial logit model
	Guimarães, Figueiredo, & Woodward (2000) and (2003)	New establishment location at a concelho-level. Considered the ones that were partly or totally created with foreign capital.	(1) Industry-specific employment variables: total manufacturing agglomeration (+); industry-specific agglomeration (+); service agglomeration (+) (2) Regional characteristics: elementary education (-); distance to Porto and Lisbon (+); and two dummies representing if the district belongs to Porto (+) or Lisbon (+).	Portugal	1985-1992	Conditional logit model (2000). Poisson regression model (2003)
	Gabe & Bell (2004)	Number of business investments per	(1) County dummy variables (±) (2) Portland (the largest city) dummy variable (-) (3) Industry dummies (±)	United States	1993-1995	Poisson regression model

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Spatial Context	Reference	Key Variables		Country	Years of data	Analysis Method
		Dependent	**Explanatory variables**[2]			
		location at municipality-level	(4) Presence of local high school (+) (5) Local fiscal policies as the amount of school subsidies received per pupil from state and federal resources (-) (6) Local government spending other than public education (+) (7) Distance to nearest interstate highway (-) (9) Agglomeration factors: municipality size (+) and industry concentration (+)			
	Brinkman, Coen-Pirani, & Sieg (2011)	Entry, exit and relocation inside and outside the central business district (CBD)	(1) Age: older firms tend to relocate in the CBD (2) Employment: companies that have more employees tend to relocate in the CBD (3) Facility type: larger companies tend to relocate in the CBD	United States	2008	Dynamic general equilibrium model
	Kimelberg & Williams (2013)	Importance of 39 business location factors	Most important factors for different industries: (1) Office: parking, rental rate, labour availability, timely permits, state incentives, crime rate, traffic and physical attractiveness (2) Manufacturing: labour availability, access to highways, parking, labour cost, rental rate, timely permits and state incentives (3) Retail: land cost, predictability, timely permits, traffic, infrastructure, rental rate and highway	United States	2005-2006	Four-point Likert scale
	Elgar et al. (2009)	New and re-locating firms location at a zonal-level	(1) Re-locating firms: distance to Toronto CBD (+); the number of buildings in the zone (+); number of jobs in the zone (+); zonal density was significant only for small firms (+); household income of the zone was important for architecture and engineering firms (-); distance to the firm's current location (-); distance to the owner's residential location (-). (2) New firms: distance to Toronto CBD (-); number of buildings in the zone (+); number of jobs in the zone (+); distance to the owner's residential location (-); number of workers employed in the zone for small firms (+).	Canada	2006	Conditional logit model

Spatial Context	Reference	Key Variables		Country	Years of data	Analysis Method
		Dependent	**Explanatory variables[2]**			
	Linnenluecke, Stathakis, & Griffiths (2011)	Business relocation decisions	Can be influenced by climate changes and (1) Increase of bushfire risk (2) Increase of temperatures, causing more drought.	Australia	-	Discussion paper
	Hensher, Teye et al. (2017)	Number of firms and jobs in a given zonal location (industry-specific)	Most important across all industries: weighted average residential dwelling price (±), the mean income of workers (+), the mean age (±) and education level attained of workers (+). In many industry sectors, key influences are employee accessibility (+), effective employment density (+).	Australia	2011	Three stage least square system of equations
	Jiang, Timmermans, & Yu (2018)	Relocation of the electronic and information industry in the Yangtze River Economic Belt	Five most important factors: Labour costs, market scale, land rent, transport cost and preferential policy	China	2008	Statistical analysis
	Brouwer, Mariotti, & van Ommeren (2004)	Whether a firm has relocated or not in the past three years	(1) Size: Over than 1501 employees (-); if the company had increased or decreased the number of employees in more than 5% (+) (2) Age: Older than 80 years (+) (3) Sector: Quartiary services (+) (4) Market: Local (+) (5) Location: operation in West or South Europe (-) (6) Others: if the firm had been involved in an acquisition, merger, or take-over (+); if the firm operate in only one site (-); if it is an international corporate headquarter (+).	Different countries in Europe, North America, Asia and Oceania	1997-1999	Multinomial logit model
Local/Regional Residential Location Decisions	Portnov & Schwartz (2008)	Annual population growth	(1) Location characteristics: Population size of localities (-), distance to seashore (+), distance to the closest major city (-), climate harshness (-), and interaction between the location's latitude and elevation (-).	European countries	1990-1991 and 2000-2001	Regression analysis model

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Spatial Context	Reference	Key Variables		Country	Years of data	Analysis Method
		Dependent	Explanatory variables[2]			
			(2) Dummy variables representing the different countries were also included (±). *The relative location factors were better estimators than the absolute ones.			
International Business Relocation Decisions	Sleuwaegen & Pennings (2006)	Relocation by multinational enterprises at a country-level	Main drivers in the decision to relocate to another country (remote or nearby): (1) Firm characteristics: Profitability (-); labour-intensive firms (+); multinational groups (+); if they operate in the manufacturing industry (+) Main drivers in the decision to relocate to remote regions: (1) Market potential (+) (2) Industry type: firms in manufacturing industry (-)	Belgium	1990-1999	Nested logit model
	Lampón, González-Benito, & García-Vázquez (2015)	Whether a plant was relocated or not during 2001-2008. Considered only the automobile parts manufacturing sector	(1) Productivity compared to other plants in the sector in Spain (-) and other plants of the same company (-) (2) Number of alternative plants owned by the multinational (+) (3) Ownership of the company is foreign (+) (4) Production complexity (-) (5) Age (-)	Spain	2001-2008	Logistic regression model
	Contractor, Kumar, Kundu, & Pedersen (2010)	Business international relocation decisions	Company strategy: outsourcing and offshoring	-	-	Discussion paper
	Prange & Verdier (2011)	Business internationalisation	Business strategies: a balance between exploiting existing capabilities and exploring new ones	-	-	Discussion paper
	Baldwin & Okubo (2014)	International relocation decisions	Freer trade: the trade policies in the country where the firm is located has an effect on its productivity and thus in its location decisions.	-	-	Discussion paper

Local/Regional Location Decisions

Netherlands

Van Dijk & Pellenbarg (2000) study firm location decisions in The Netherlands. They use a dataset collected in 1995/1996 from the panel of firms managed by the Faculty of Spatial Sciences at the University of Groningen. This questionnaire asked the firms to indicate the probability of moving in 1996 or 1997 with eight categories: 0%, 0-10%, 10-25%, 25-50%, 50-75%, 75-90%, 90-100%, and 100%. The authors considered this response as an ordinal ranking between 0 and 7 and estimated an ordinal logit model (Greene & Hensher, 2010). The firm internal factors considered as explanatory variables were the economic sector, firm size (employees) and previous migration behaviour. There are seven economic sectors: (1) manufacturing/industrial; (2) construction, (3) wholesale, (4) retail and hotels/restaurants/cafes (horeca), (5) transport, (6) commercial services and (7) non-commercial services. Location factors considered were: type of area (e.g., inner city, city border, etc.); type of enterprise zone/industrial site (e.g., mainly offices, heavy industry, etc.), infrastructure facilities (e.g., close to main road to city centre, motorway, public transport, etc.), ownership of the building (i.e., percentage of ownership and if they are the only user in the building), opinion about present location (i.e., location tension variable based on 20 questions regarding the growth of the number of employees, the accessibility, increasing criminality, and policies around the area), and if they thought there is a need for revitalisation (i.e., scale defined from 'not necessary' to 'really necessary'). The firm external factors included a set of regional dummies (representing regional subdivisions), and the opinion of firms about government policy (based on questions referring to their opinion on a scale from 1 to 10 about the European Union, national and regional/local policies).

The model results in Van Dijk & Pellenbarg (2000) found that the variables that were significant and had a positive influence on the propensity to move in the next few years were: the non-commercial services sector; if a firm had moved between 1981-1985; if it was in the city border; a higher location tension; need for revitalisation. Contrarily, the variables that were statistically significant and represented a lower probability to move were: retail and horeca sectors; firm size; if the last time they moved was between 1986 and 1990; if the site is used for heavy industry; and if the firm owns the building.

Risselada & Schutjens (2012) investigate the factors that influence business location decisions for different neighbourhood entrepreneurs (e.g., home based businesses (HBB), firms in commercial property (FCP), and firm start-ups). They surveyed 370 entrepreneurs from 41 residential neighbourhoods of five cities in The Netherlands (i.e., Amsterdam, Dordrecht, Leiden, Utrecht, and Zoetermeer) in 2011. The cities differ in size, physical structure, age and economic background. The authors selected those neighbourhoods that are defined as 'purely' residential (i.e., have more than 500 residential addresses, and are not the city centre nor have an industrial site within them).

Models are estimated by ordinary Least Squares (OLS) regression where the dependent variable is the relative importance of real estate factors, defined as the average score[3] of the property factors (e.g., floor plan design, size of property, etc.) minus the average score of the location factors (e.g.,

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[3] A score was given to each factor, where the maximum score was 5. A larger score represents a higher importance.

accessibility, residence of employees, etc.)[4]. The candidate explanatory variables of the firm include age, size, sector (i.e., industry, transport, wholesale and car repair; public sector and healthcare; consumer services; financial services; business services), previous location (i.e., none; HBB, FCP), % of work time spent at a business property, dummy variables for working more than half of the time at the business property, and if the business property is a place for direct contact with business relations. The candidate variables describing the neighbourhood include the percent of welfare recipients, percent of private owned housing, percent of non-western migrants, and property value. The results show that the FCP sector finds the business property factors significantly more important than the start-up and HBB sectors. Businesses that are used to meeting with business clients/partners assign a higher level of importance to property values than businesses that do not have face to face meetings. However, these results are not statistically significant when the neighbourhood characteristics are included. In every model the results suggest that entrepreneurs who spend a lot of time in the business property find the property characteristics more important. The findings show that the wholesale and car repair sectors attach more importance to property factors (e.g., size, age, etc.) than to location factors.

Switzerland

Bodenmann (2011) and Bodenmann & Axhausen (2012) test the impact of different *pull* factors for relocating firms in three Swiss cantons: St Gallen, Appenzell Ausserrhoden, and Appendell Inerrhoden. They use data collected by the commercial registers of each of the Swiss cantons, which contained information about 54,000 firms and autonomous plants between 1991 and 2006. This information was enriched by adding the sector identification and size indication obtained from the business and trade register of the Federal Office for Statistics. The independent variables tested were (1) factors of production: land price and residuals for commerce and industry; land price and residuals for residential use; degree of land use in building zones; unemployment rate; population with graduate degrees, (2) business environment: if the relocating site or the previous site were located in a large or intermediate city; rate of employees (i.e., total number of employees working in the same sector / total number of residents in the area) within the same sector (calculated as a weighted sum between the municipalities within a radius of 30km); index of diversity of sectors, (3) government environment: tax burden for partnerships; for joint stock companies; for holding companies; if the municipality has a motorway connection and if it has a rail station; accessibility of employees; duration of building licence application process; cantonal business development, and (4) distance to the previous site. The authors use a nested logit model, where the first branch represents the decision to not move and the second branch the decision to move.

The results of the final model show that the variables that were statistically significant and had a negative effect on the business location decision were: land prices and residuals; the tax burdens for all the options; and the duration of the approval process for building license application. The variables

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[4] Five property factors were included: look and feel of property, floor plan design, size of property, availability of property and contractual conditions linked to property. 11 location factors: accessibility by public transport and by car, costs considerations, private life considerations, collaboration possibilities, residence of employees, presence of other firms, amenities in neighbourhood, potential local market, mixed use in neighbourhood, reputation in neighbourhood.

that had a significant and positive effect on the location decision were: rate of economically active population with a graduate degree; all the business environment variables; the motorway connection and rail station; and the cantonal business development plan. The nested logit model for different industry sectors showed significant differences across them. For example they found that the public and personal service sector, as well as the gastronomy and hotels sector, weight the moving disadvantage much more heavily compared to other industry sectors.

United States

Gabe and Bell (2004) undertake a study in Maine, United States using the Covered Employment and Wages[5] dataset of businesses that commenced their operations in the largest municipalities between 1993 and 1995. The data excludes companies with fewer than ten employees. The authors estimated models with two different dependent variables: (1) the number of business investments per municipality-industry (1,032 observations), and (2) the number of business investments per municipality (129 observations). They use the Poisson regression model (Greene, 2012) where the independent variables are county dummy variables, a dummy variable for the city of Portland (the largest city), dummy variables controlling for the industry, and dummy variable equal to one if the location has a high school. The variables that had a positive effect on the number of business investments were: presence of a local high school; local government spending on items other than public education; municipality size; and industry concentration. Contrarily, the distance to the nearest interstate highway and the Portland dummy variable had a negative effect, and the majority of the country variables were significant (with different effects each). They also included local fiscal policy variables as the amount of school subsidies received per pupil from state and federal resources, which represents the net effect of a change in the variable of interest, with an offsetting change in the amount of taxes received by local government. This variable was negative, which suggests that an increase in the municipality's reliance on subsidies for public education – to balance a decrease in local taxes – leads to a decrease in the number of business investments. This study presents interesting findings, especially on the local tax policy which has a significant effect on business location decisions.

Australia

Hensher, Teye, et al. (2017) developed an aggregate business location model estimated as a three stage least square system of equations to study the drivers of the number of firms and jobs in a given location. The authors collected data from a variety of secondary sources for year 2011 in Australia regarding land use, zone boundaries, census data, businesses characteristics, rents and property prices, and number and type of building structures. They estimate separate models for different industries, such as manufacturing, accommodation and food services, agriculture, forestry and fishing, mining, health care and social assist, etc. The explanatory variables included were the access to key transport nodes, access to key markets, average rental price for a residential dwelling, weighted average residential dwelling price, population density, industry density, mean income, number of people in a zone with compulsory education background, with University degree and higher degrees, mean age, effective employment density (see Hensher et al., 2012), proportion of the zone classified as agricultural, industrial and hospital/medical, number of associated firms, employment of labourers in each industry, and warehousing. Although there were some statistically significant different

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[5] Data provided by State Workforce Agencies (SWAs) and found in the Bureau of Labor Statistics website of the United States Department of Labor.

variables across the industry sectors, there were also a number of consistently important drivers across all sectors, notably weighted average residential dwelling price, the mean income of workers, the mean age and education level attained of workers, employee accessibility, and effective employment density. This model has been integrated into MetroScan (Hensher, Ho, et al., 2017).

Different countries in Europe, North America, Asia and Oceania

Brouwer et al. (2004) study business relocation decisions in twenty one countries in Europe. They consider three types of drivers: firm-internal, firm-external, and location attributes. They use the 1999 Cranfield Network on European Human Resource Management Survey, which considers private and public firms in different countries, with the questionnaire sent to senior human resources or personnel specialists. The dataset includes firms with more than 200 employees, giving a total of 5,568 observations. The countries included are: (1) North Europe: Denmark, Sweden, Norway and Finland; (2) West Europe: United Kingdom, the Netherlands, Ireland, Germany, Austria, Belgium, Poland and Switzerland; (3) South Europe: Spain, Italy, France, Czech Republic, Hungary and Greece; (4) Outside Europe: Australia, New Zealand, Japan and United States.

The authors estimate a binary logit model where the choice variable is whether a firm has relocated in the last three years (1997-1999). The results show that the variables that decrease the tendency to move are: larger firms (more than 1,500 employees); older firms (with more than 80 years); firms that serve local markets compared to the ones that serve national or international markets; firms that operate in West Europe and South Europe compared to those that operate in North Europe or outside Europe; and firms that operate in only one site. Contrarily, the tendency to move is increased by the following variables: quartiary services industry in comparison to manufacturing, public services and tertiary services; increase or decrease (more than 5%) in the number of employees in the firm; if the firm had been involved in an acquisition, merger or take-over recently; and if the organisation was an international corporate headquarter. Although the study focused on the business location drivers in different countries, the authors did not analyse the effect of international relocation.

International Relocation Decisions

Belgium

Sleuwaegen & Pennings (2006) study relocation across countries for multinational enterprises. In Belgium, when a company relocates they have to report it and complete government documentation. The form asks for details of the country they are moving to and to rank certain factors in terms of the importance in their relocating decision. The authors use this information, together with financial information of the company provided by the National Bank of Belgium, as the sample of relocating firms. 51% of the firms moved to countries close to Belgium: 18% of the relocating firms to France, 13% to the Netherlands, 12% to Germany, 8% to the U.K., and 1% to Luxemburg. The authors also use a sample of non-relocating companies between 1990 and 1999 in Belgium.

The analysis considers firm variables such as value added, capital/labour, an index for profitability relative to sales, if the company operated in the manufacturing industry, and if the company is a multinational enterprise (i.e., if it has at least one subsidiary abroad or belongs to a foreign-based company). Regional variables are included such as wage and market potential (i.e., GDP in the host region plus distance-adjusted GDP in surrounding regions), where both variables are defined as an index. The authors estimate a nested logit model (Hensher, Rose, & Greene, 2015) where the region

choice affects the profitability of relocation through an inclusive value (or logsum). The choice variable is whether the firm chooses to relocate or not, and conditional upon relocation, the firm determines the location (separated into nearby locations and remote locations). The results show that less profitable firms are more likely to relocate, as well as labour-intensive firms, multinational groups, and firms operating in the manufacturing industry. For regional choice, the findings suggest that market potential is an important determinant for relocation in remote regions, with companies that have a higher added value having a higher probability to move to remote regions. In contrast, companies in the manufacturing industry are less likely to move to remote regions.

The studies summarised above provide a good starting point in establishing a list of candidate influences on location decisions, with limited evidence on relocation decisions. In the following sections we consider important practical issues in future data collection at the firm level where selecting the person(s) involved in making location decisions is very important in primary data collection, as is the extent to which suitable data might be extracted from more aggregate spatial data sources which is less dependent on firm-specific data.

4 Decision-maker and decision-making approach

One of the most important issues in studies of business location is identifying relevant decision-makers. This is a critical issue in empirical research where primary data is to be collected that is more than simply factual data such as number of employees, since the preference responses are very dependent on who provides data on the factors influencing a firm's location decisions, past and present. Preferences for degrees of accessibility to classes of employees, for example, might vary according to who is interviewed. The existing literature on the influence of different decision agents is quite limited, but what is available is summarised in this section.

Decker & Crompton (1993) study three types of decision-makers: executives within the company, company relocation consultants, and economic development personnel. The study was undertaken in Texas, United States with all companies interviewed being located within the state or involved in locating companies in the state. There were significant differences in the job positions of the people that formed the location decision committees, but the most frequently mentioned were: chief executive officer, board members, presidents, division heads, departmental directors and managers in finance, personnel, marketing, operations, computing, human resources, research and legal operations. With so many different participants in the decision making process across the surveyed firms, primary data collection becomes a very real challenge (as well as secondary data sourcing).

In this same context, Decker & Crompton (1993) present three strategies used in business location decisions. The first is an autocratic approach where the decision is made by key decision-makers and it is not systematic or objective. The second is the democratic approach that leaves the decision to the employers. The third is the scientific approach which considers a location fit analysis where different criteria are identified and the location that provides a better fit is selected[6]. They did not interview the executives within the company regarding their strategy because the authors considered they might feel offended by the autocratic approach. The results for the relocation consultants and the economic development personnel are summarised in Figure 2. The approach used more frequently is

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[6] A group of people from the company or an external consulting firm weights different characteristics of the locations and makes a rational decision.

the scientific one, with an average of 77% for relocation consultants and 66% for the economic development personnel. The results show that relocation consultants also use the autocratic approach in all the industries interviewed (with an average of 30%) except for the research and development industry. In the case of the economic development personnel decisions, there are significant differences between industries. In the high technology industry, the autocratic and democratic approaches are each used by 8% of the sample; in the research and development industry 20% uses the democratic approach and 8% the autocratic approach. In the services and headquarters industry, a higher percentage use the autocratic approach (average of 36%) than the democratic approach (average of 10%). This result suggest that not only the decision-maker is crucial in business location but also the approach used to reach a decision. Such data needs to be collected in an initial phase of firm location studies in order to establish appropriate respondents in the main survey. It is clear that respondents may be advisers to a firm and not always employees or owners.
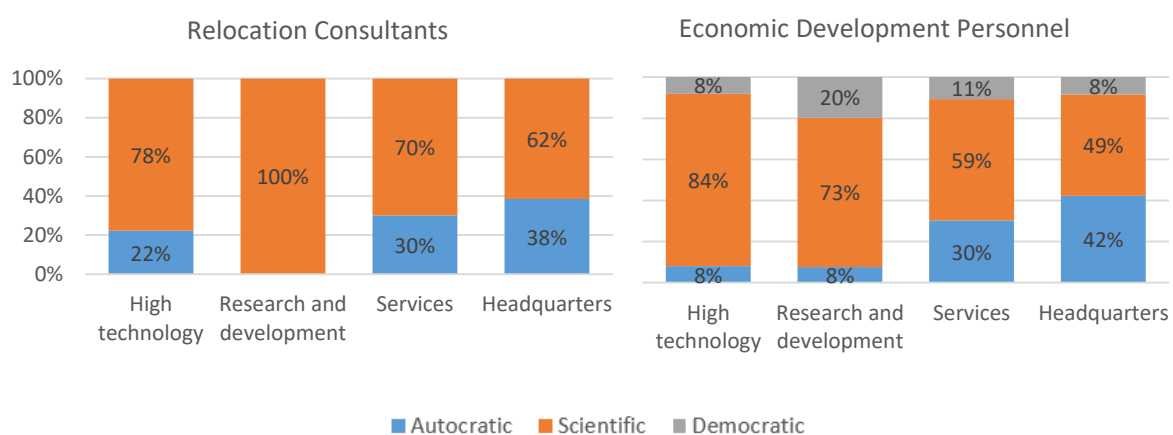

Figure 2: Approach used most often in business location per industry and decision-maker.
Source: Decker and Crompton (1993)

A study by Hensher & Puckett (2008) is particularly interesting as it provides an approach to study the negotiation process between more than one decision-maker, which is certainly the case in many business location decisions. They studied the strategies that transporters and shippers use in freight transport distribution and identify if these decisions are predominantly different. This is particularly important because, if the strategies are different, a decision would be made through negotiation between the two decision-makers. They estimate a transporter and a shipper concession model, where they studied if they would be willing to accept the other decision-maker first preference or if it would be unacceptable to them. Their results show that both decision-makers hold a strong position on some attributes and are willing to compromise in others.

Kimelberg & Williams (2013) invited members of two national real estate trade associations, formed by both CRE managers (i.e., area inside the company in charge of real estate) and other service providers (e.g., developers, location specialists). Their objective was to obtain responses from a wide range of decision-makers; however, they did not provide a detailed analysis of the responses/interviews of the different decision-makers. Subsequently, Kimelberg (2014) interviewed 15 of the same respondents using open-ended questions regarding their thoughts on the survey and the factors included in it. The findings suggest that real estate professionals strongly rely on subjective,

informal or qualitative sources of information (e.g., word of mouth, and what other companies are doing). Although the influence of the source of information per decision-maker was not investigated, it was promoted as a theme for future research.

This brief assessment of who is involved in location decisions suggests a need to establish the relevant decision makers before undertaking a survey to obtain preference data that informs location decisions. This might be undertaken using an online panel of businesses. One such panel is B2B in SSI which serves up business leaders who are carefully recruited and precisely profiled (https://www.surveysampling.com/). SSI recruits from our millions proprietary panelists to determine their job role/company size/revenue and other factors giving access to IT decision makers, executive/upper management, small business owners, business decision makers, financial services professionals, contractors, HR professionals and others.

5 Data Collection and Methodological Approaches

Different spatial and data type approaches have been reported in the literature to investigate business location decisions. Some studies have focused on understanding firm-specific decisions at a disaggregate level, and location-based decisions at an aggregate spatial level; and some studies have used revealed preference data, with a few using stated preference experiments.

5.1 Firm-Specific Decisions

Business location studies that have considered the decisions made at a company-level are within this category. However, they can be divided into ones that considered real decisions or revealed preferences, and others that considered hypothetical or stated responses.

Real Decisions or Revealed Preferences

A number of studies – whose main drivers were discussed in the previous section - collected information on real-life decisions made by companies. For example, Elgar et al. (2009) study revealed preferences by asking companies for their current location, all their previous locations and the timing of their relocations. They also collected information on the companies' characteristics and neighbourhood characteristics. They analysed the companies' relocation behaviour in real-life to understand how different attributes might have influenced their decisions, as discussed in a previous section.

Brouwer et al. (2004), collected information on whether the firm had relocated in the last three years and used this real-life information to model location behaviour. Sleuwaegen and Pennings (2006) also use revealed preference information provided by companies to inform their relocation to the government. Lampón et al. (2015) used revealed preferences by using information on plants that were relocated from Spain during 2001-2008, plants that have maintained their location in Spain during this period, or plants located in Europe that belong to the same multinational as the active and relocated plants. Similarly, the studies Bodenmann (2011), Bodenmann & Axhausen (2012), Backman & Karlsson (2017), Guimarães et al. (2000), Brinkman et al. (2011) used real decisions that had already been made by companies and tried to understand the main drivers, which were all analysed in the previous section.

Hypothetical or Stated Responses

In contrast to revealed preference data, some studies asked respondents to consider alternative hypothetical situations, where no real decision had to be made, and to choose the most preferred location option, or indicate the probability of moving under specific conditions. For example, Van Dijk & Pellenbarg (2000) asked respondents to indicate the probability of relocating in the next few years and then tried to explain this stated probability with internal factors and other characteristics that might be influencing this hypothetical decision.

Risselada & Schutjens (2012) showed entrepreneurial companies real estate characteristics and asked them to indicate the importance they assign to them when looking for their business location. Similarly, Kimelberg & Williams (2013) showed multiple business location drivers to respondents and had them assign a level of importance using a four-point Likert scale.

In all of these studies, the hypothetical setting was not designed as a choice experiment using state of the art design principles to define alternatives associated with designed levels of attributes (see Louviere, Hensher, & Swait, 2000); rather the focus was on a listing of attributes associated with a firm at the time of data collection and a question asked about their possibility of moving on some ordered probability scale.

5.2   Location-Specific Decisions

Some studies analyse business location decisions at an aggregate level where the data is not firm-specific. Such secondary data is often available from government census sources and can be described as average estimates for each and every explanatory variable at a specific spatial detail for an industry class. For example, Hensher, Teye, et al. (2017) develop a model where the dependent variable is the number of firms by industry class located in a zone and the number of jobs. The data required for this type of study is zone-based, e.g., number of firms dedicated to manufacturing in the zone, and the average number of employees per company in the sector. Geographically-detailed, aggregate data on firms are relatively scarce in some countries such as Australia, and require the integration of multiple data sources, covering different aspects of demographics, population, business statistics, and land use characteristics. The main sources of data used were the 2011 Australian Census of Population and Housing, the Australian Bureau of Statistics (ABS) dataset on Business Counts, ABS GIS layers for zone boundaries, and land use data. This was combined with data from the Australian Property Monitor (APM) on rents and property prices, and the GeoScience Australia NEXIS database on the number and type of building structures.

Gabe & Bell (2004) study the number of business investments per municipality and municipality-industry in order understand how decision location decisions are made at a municipality-aggregate level. The data used refers to the number of business investments per location at a municipality-level. Another example is shown in Portnov & Schwartz (2008) on residential location decisions, where they investigate relocation based on the annual population growth.

6 Discussion and Conclusions

The rationale for firm location and re-location decisions is an important theme in the development of integrated transport and location (land use) strategic model systems. Unlike the residential location (and relocation) literature which is extensive, there has been far less effort placed on investigating the drivers of firm location decisions (ILUTE in Canada and MetroScan in Australia are exceptions). If we are to develop firm location and relocation decision models where these are endogenous influences on the demand for transport infrastructure and services, then it is important to gather together the evidence to date on what data items should be considered in future empirical studies (and new surveys).

This paper has reviewed the main contributions to this literature, in order to draw out of it a synthesis of the key drivers of location and relocation decisions that are starting data items in future surveys. Specifically, we are interested in what data items should be collected in general, with advice on the units in which they should be defined, as well as which items are candidates for a stated choice experiment in contrast to being contextual influences on choice outcomes. Sleuwaegen & Pennings (2006) develop a nested logit model that incorporates both location and relocation choices within a revealed preference (RP) setting, which is an appealing framework within which to accommodate both choices; however as far as we can tell, there has been no formal stated choice experiment associated with any of these studies to enable joint estimation using combined RP and SC data, something that we believe has merit. The literature review presented in Section 3 (and the Appendix to this paper) has provided important guidelines as to the most important key drivers in business location decisions in different contexts and industries. Some of the most relevant ones are firm size (number of employees), current location, ownership of the building, if it is a start-up, industry, educational characteristics of the employees, and if it is foreign-owned. Some of these attributes may be more important in the decision to relocate and others in the actual choice of a location. Table 3 presents candidate drivers to be included in an SC experiment that have been informed by the literature review, and which can be predicted (or at least tested as a scenario), and therefore used for forecasting business location decisions. Some of the attributes investigated in the literature that were significant in business location decisions refer to specific events that are not predictable - such as mergers, or a decrease/increase in the number of employees – and therefore are not included in this table. It will also be relevant to investigate characteristics of the company that will need to be included in the modelling as contextual effects and conditioning agents on the attributes found to be important in the SC experiment (which we refer to as heteroscedasticity conditioning – see Hensher & Ho, 2016) which have been shown to have a significant influence on location behaviour. Some of the most relevant ones are firm size (number of employees), current location, ownership of the building, if it is a start-up, industry, educational characteristics of the employees, and if it is foreign-owned. Some of these attributes may be more important in the decision to relocate and others in the actual choice of a location.

Table 3: Candidate drivers for a stated choice experiment

Attribute	Description
CBD located	Dummy variable equal to 1 if location is in the CBD of the city, or 0 otherwise
Distance to the CBD	As a linear or non-linear form in kilometres
Land use	Residential area, mainly offices, mainly transport activities, heavy industry, light industry
Accessibility to public transport	Measured either as travel time or an inclusive value (logsum) variable
Accessibility to highway/motorway	Measured either as travel time or an inclusive value (logsum) variable
Access to key markets	Access to market opportunities outside the area, measured as travel time or an inclusive value (logsum) variable
Safety	Crime rate
Pollution	Pollution index or other environmental index
Land price	Unimproved property value or building value as a proxy for location rent
Average rental price for a house	
Education	The incidence of employees with graduate qualifications
Residential density	Population per square kilometre
Industry density	Jobs per square kilometre
Presence of a high school in the area	A 1,0 dummy variable
Presence of a hospital in the area	A 1,0 dummy variable
Parking facilities	
Household income in the area	Median annual gross personal income
Number of workers employed in the area	
Tax burden	For partnerships, for joint stock companies, for holding companies, etc.

In addition to determining data needs in ongoing studies, a big challenge is identifying who to interview, since it is clear from the literature that there are many relevant respondents, as employees of a business as well as advisers. It may be that certain influencing factors are controlled by certain individuals (e.g., cost of moving is controlled by the CFO or Managing Director) or the head office, which makes it challenging in arranging interviews where data is related to preferences in contrast to factual evidence such as the number of employees, current location etc.

Furthermore, it is far from clear as to whether a model system estimated at a firm level with firm-specific and location -specific variables defining the unit of analysis and the choice being that of a firm, is preferred to an aggregate model system where the unit of analysis is the number of firms by industry class located in a spatial setting (e.g., a statistical district), with explanatory variables in the latter setting being defined in aggregate and only relevant to the average representation of firms within an industry and spatial setting. The decision in part must be influenced by the reliability of data that is used in undertaking forecasts in integrated transport and location modelling systems.

The next phase in our research will use the evidence from this paper to develop a firm-specific survey to collect RP and SC data and to develop choice models for location and relocation decisions. The

models will be compared to aggregate models that have been developed in Hensher, Teye, et al. (2017), which are implemented in MetroScan (Hensher, Ho, et al., 2017). The integration of data from both aggregate and firm-specific sources is likely to provide an appealing way of accommodating the variability captured at the firm level with the spatial richness offered from secondary data defined as a zonal location level.

References

Backman, M., & Karlsson, C. (2017). Location of New Firms: Influence of Commuting Behaviour. *Growth and Change*, (404). https://doi.org/10.1111/grow.12200

Bagchi-Sen, S., & Hayter, R. (2001). The Dynamics of Industrial Location: The Factory, the Firm and the Production System. *Economic Geography*, *77*(1), 77. https://doi.org/10.2307/3594090

Baldwin, R. E., & Okubo, T. (2014). International trade, offshoring and heterogeneous firms. *Review of International Economics*, *22*(1), 59–72. https://doi.org/10.1111/roie.12096

Bodenmann, B. R. (2011). *Location choice of firms with special emphasis on spatial accessibility*.

Bodenmann, B. R., & Axhausen, K. W. (2012). Destination choice for relocating firms: A discrete choice model for the St. Gallen region, Switzerland. *Papers in Regional Science*, *91*(2), 319–341. https://doi.org/10.1111/j.1435-5957.2011.00389.x

Brinkman, J., Coen-Pirani, D., & Sieg, H. (2011). Agglomeration Externalities and the Dynamics of Firm Location Choices within an Urban Economy. *https://web.stanford.edu/group/SITE/archive/SITE_2011/2011_segment_2/2011_segment_2_papers/sieg.pdf*. Retrieved from http://www.stanford.edu/group/SITE/archive/SITE_2011/2011_segment_2/2011_segment_2_papers/sieg.pdf

Broadbent, S. R., & Hammersley, J. M. (1957). Percolation processes: I. Crystals and mazes. *Mathematical Proceedings of the Cambridge Philosophical Society*, *53*(3), 629–641. https://doi.org/10.1017/S0305004100032680

Brouwer, A. E., Mariotti, I., & van Ommeren, J. N. (2004). The firm relocation decision: An empirical investigation. *Annals of Regional Science*, *38*(2), 335–347. https://doi.org/10.1007/s00168-004-0198-5

Chingcuanco, F., & Miller, E. J. (2018). The ILUTE Demographic Microsimulation Model for the Greater Toronto-Hamilton Area: Current Operational Status and Historical Validation. In S. Dragicevic & J. C. Thill (Eds.), *GeoComputational Analysis and Modeling of Regional Systems* (pp. 167–187). Springer.

Contractor, F. J., Kumar, V., Kundu, S. K., & Pedersen, T. (2010). Reconceptualizing the firm in a world of outsourcing and offshoring: The organizational and geographical relocation of high-value company functions. *Journal of Management Studies*, *47*(8), 1417–1433. https://doi.org/10.1111/j.1467-6486.2010.00945.x

Decker, J. M., & Crompton, J. L. (1993). Attracting Footloose Companies. *Journal of Professional Services Marketing*, *9*(1), 69–94. https://doi.org/10.1300/J090v09n01_07

Elgar, I., Farooq, B., & Miller, E. (2009). Modeling Location Decisions of Office Firms. *Transportation Research Record: Journal of the Transportation Research Board*, *2133*, 56–63. https://doi.org/10.3141/2133-06

Elgar, I., Miller, E. J., & Farooq, B. (2008). *Development of an operational integrated urban model system, Volume VI: Modelling firm mobility & location choice*. ILUTE Project, Urban Transportation Research & Advancement Centre, University of Toronto (Vol. VI).

Gabe, T. M., & Bell, K. P. (2004). Tradeoffs between local taxes and government spending as determinants of business location. *Journal of Regional Science*, *44*(1), 21–41. https://doi.org/10.1111/j.1085-9489.2004.00326.x

Greene, W. H. (2012). *Econometric Analysis*. *Prentice Hall*. https://doi.org/10.1198/jasa.2002.s458

Greene, W. H., & Hensher, D. A. (2010). *Modeling ordered choices: A primer*. *Modeling Ordered Choices: A Primer*. https://doi.org/10.1017/CBO9780511845062

Guimarães, P., Figueirdo, O., & Woodward, D. (2003). A Tractable Approach to the Firm Location Decision Problem. *The Review of Economics and Statistics*, *85*(1), 201–204. https://doi.org/10.1162/003465303762687811

Guimarães, P., Figueiredo, O., & Woodward, D. (2000). Agglomeration and the Location of Foreign Direct Investment in Portugal. *Journal of Urban Economics*, *47*(1), 115–135. https://doi.org/10.1006/juec.1999.2138

Hensher, D. A., & Ho, C. Q. (2016). Experience conditioning in commuter modal choice modelling – Does it make a difference? *Transportation Research Part E: Logistics and Transportation Review*, *95*, 164–176. https://doi.org/10.1016/j.tre.2016.09.010

Hensher, D. A., Ho, C. Q., Ellison, R. B., Liu, W., Teye, C., & Weisbrod, G. (2017). MetroScan TI: a quick scan capability to identify value adding transport initiatives. *Latest Draft 18 March 2016*.

Hensher, D. A., & Puckett, S. M. (2008). Power, concession and agreement in freight distribution chains: Subject to distance-based user charges. *International Journal of Logistics Research and Applications*, *11*(2), 81–100. https://doi.org/10.1080/13675560701530040

Hensher, D. A., Rose, J. M., & Greene, W. H. (2015). *Applied Choice Analysis - Second Edition*. Cambridge University Press. https://doi.org/10.1017/CBO9780511610356

Hensher, D. A., Smith, N. C., Milthorpe, F. W., & Barnard, P. O. (1992). *Dimensions of Automobile Demand: A Longitudinal Study of Household Automobile Ownership and Use*. North-Holland, Amsterdam.

Hensher, D. A., Teye, C., Ellison, R. B., & Ho, C. Q. (2017). *Integrating an aggregate model of intra-metropolitan business location choices into a location-based employment model*. *Institute of Transport and Logistics Studies (ITLS), University of Sydney (Working Paper)*.

Hensher, D. A., Truong, T. P., Mulley, C., & Ellison, R. (2012). Assessing the wider economy impacts of transport infrastructure investment with an illustrative application to the North-West Rail Link project in Sydney, Australia. *Journal of Transport Geography*, *24*, 292–305. https://doi.org/10.1016/j.jtrangeo.2012.03.009

Jiang, Y. (2012). Relocation Patterns of Regional Industries and Their Impacts on Port Logistics System.

Jiang, Y., Timmermans, H. J. P., & Yu, B. (2018). Relocation of manufacturing industry from the perspective of transport accessibility – An application of percolation theory. *Transport Policy*, *63*(April 2017), 10–29. https://doi.org/10.1016/j.tranpol.2017.11.003

Kimelberg, S. M. (2014). Labor needs, crime, and the business location decision: a qualitative account. *Community Development*, *45*(1), 45–59. https://doi.org/10.1080/15575330.2013.840006

Kimelberg, S. M., & Williams, E. (2013). Evaluating the Importance of Business Location Factors: The Influence of Facility Type. *Growth and Change*, *44*(1), 92–117. https://doi.org/10.1111/grow.12003

Lampón, J. F., González-Benito, J., & García-Vázquez, J. M. (2015). International relocation of production plants in MNEs: Is the enemy in our camp? *Papers in Regional Science*, *94*(1), 127–139. https://doi.org/10.1111/pirs.12056

Linnenluecke, M. K., Stathakis, A., & Griffiths, A. (2011). Firm relocation as adaptive response to climate change and weather extremes. *Global Environmental Change*, *21*(1), 123–133. https://doi.org/10.1016/j.gloenvcha.2010.09.010

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: analysis and applications*. *Analysis and Applications* (Vol. 12). https://doi.org/10.1002/jae.701

McFadden, D. (1978). Modelling the choice of residential location. *Spatial Interaction Theory and Planning Models*. Retrieved from http://cowles.econ.yale.edu/P/cd/d04b/d0477.pdf

Pellenbarg, P. H., Van Wissen, L. J. G., & Van Dijk, J. (2002). *Firm relocation: state of the art and research prospects. (Working Paper)*. Retrieved from http://www.rug.nl/staff/p.h.pellenbarg/artikelen/publicaties/35._firm_relocation-

_state_of_the_art_and_research_prospects.pdf

Portnov, B. A., & Schwartz, M. (2008). On the relativity of urban location. *Regional Studies*, *42*(4), 605–615. https://doi.org/10.1080/00343400701874263

Prange, C., & Verdier, S. (2011). Dynamic capabilities, internationalization processes and performance. *Journal of World Business*, pp. 126–133. https://doi.org/10.1016/j.jwb.2010.05.024

Risselada, A., & Schutjens, V. (2012). Firm location behaviour in the New Economy: Understanding the role of property factors in location decisions of neighbourhood firms. In *Paper presented at the Third ECFED International Workshop, Namur*.

Sleuwaegen, L., & Pennings, E. (2006). International relocation of production: Where do firms go? *Scottish Journal of Political Economy*, *53*(4), 430–446. https://doi.org/10.1111/j.1467-9485.2006.00388.x

van Dijk, J., & Pellenbarg, P. H. (2017). Firm Migration. *International Encyclopedia of Geography: People, the Earth, Environment and Technology*, 1–12. https://doi.org/10.1002/9781118786352.wbieg0814

Van Dijk, J., & Pellenbarg, P. H. (2000). Firm relocation decisions in The Netherlands: An ordered logit approach. *Papers in Regional Science*, *79*(2), 191–219. https://doi.org/10.1007/s101100050043

Appendix A: Additional studies on business location main drivers
Local/Regional Location Decisions

Switzerland

Backman & Karlsson (2017) study the influence of commuting behaviour on business location decisions of people that are starting with their own business. The authors compare the residential location of the entrepreneur, the previous work location, and the chosen location to start their business. The dataset was collected by Statistics Sweden. The authors considered individuals that were employed in 2007 and changed their employment to self-employed a year later. They estimate a multinomial logit model using a dependent variable with three alternatives that represents if the municipality of the new firm location was the same as the entrepreneur (1) residence location; (2) previous work location; (3) other location. The independent variables measure commuting behaviour as follows: if the individual commuted to his previous work location within the labour market (short distance) or outside it (long distance); if the individual has lived in the municipality for the past five years; if the individual has commuted in the past ten years; number of years the individual has commuted; if the individual has commuted to a more urban municipality. The labour market region is formed by grouping several municipalities that have a high commuting intensity between them. The authors also consider other explanatory variables such as: entrepreneur education type, education length, experience defined in terms of their age and number of schooling years, occupation, gender, if the individual is born outside Sweden, density of the municipality of residence and work, and the competition level in the municipality of work and residence.

Their results show that being a commuter (for both short and long distance commuters) increases the probability to start a firm in the same location as their previous work and reduces the probability of starting it in their residence location. This finding suggests that individuals create a network of customers, clients and other business around the area where they work, and this network is more important for their business than their personal network. The results of the commuting variables show that individuals who travel shorter distances are less likely to choose their residence location to start their new business compared to those ones that travel larger distances. Commuters that travel long distance are more likely to choose their work location to start their own business compared to those

that travel short distances. The years of commuting had a negative estimate in the residence location alternative and a positive estimate in the work location alternative. This means that the longer a person has been commuting, the more likely they are to choose their work location and less likely to choose their residence location to start their new firm. If an individual commutes to a more urban municipality, then he is less likely to choose his residence location, but this variable was not significant towards the work location alternative. These results suggest that when a person commutes, he is more likely to start his firm anywhere outside his residence location. Being in the same home for the past five years had a negative influence on the probability of choosing the residential or work location, which is surprising. The experience (variable defined in terms of age and schooling years) estimate suggests that if an individual has more experience, the probability to start a firm in both their residential or work location increases. Both the density of the work and residential location have a positive influence on the probability of choosing the work or residential location to start their own business. Finally, competition has a negative influence on the tendency to choose the work or residential location. This study's general conclusions are that commuting behaviour has a significant influence on business location decisions and it shows that individuals are more likely to locate their own business in the same area where they used to work rather than where they live.

Portugal

Guimarães et al. (2000) studies location decisions of foreign-owned manufacturing plants in Portugal. They use data that is annually collected by the Ministry of Employment and Social Security on all the firms operating in Portugal. The authors use the information on new establishments created between March 1985 and March 1992 that were partly or totally created with foreign capital. They use the conditional logit model form (McFadden, 1978) where the dependent variable is the location at a concelho-level in Portugal (they are relatively small administrative regions). The authors assume that the company has already decided to start a new establishment in Portugal but they have to decide where in Portugal, so it is a local/regional decision. The independent variables included are (1) industry-specific employment variables: total manufacturing agglomeration (employment per km^2); industry-specific agglomeration; foreign-specific agglomeration (foreign plants); service agglomeration, and (2) regional characteristics: labour costs; elementary education; secondary education; population density; distance to Porto and Lisbon (major cities); and two dummies representing if the district belongs to Porto or Lisbon.

The results of their final model show that most of the independent variables were significant. Total manufacturing agglomeration, the industry-specific and foreign-specific agglomeration both have a positive and significant effect on the location decision. The proportion of the labour force with elementary education level was negative and significant. The distance to Porto and Lisbon was significant and negative, while the dummy variables representing each of these cities were significant and positive.

In a later study, Guimarães et al. (2003) use a Poisson regression model (Greene, 2012) to estimate the same models in Guimarães et al. (2000). The estimates are different but the conclusions described above regarding the sign and significance for each attribute are equivalent.

United States

Brinkman et al. (2011) develop a dynamic general equilibrium model of firm location to explain entry, exit and relocation decisions. They focus their study on service industry location choices in the City of Pittsburgh and Allegheny County, excluding firms that operate in wholesale and retail, entertainment, and agriculture, forestry, mining and fishing industries. That is, they include firms operating in information, finance, real estate, professional services, management, administrative support, education, health care and related sectors. The firms are categorised by age, employment and facility size. They use data from the United States Census and firm level data from Dun and Bradstreet's Million Dollar Database for 2008[7]. They consider two locations: one that essentially represents the central business district (CBD) and the other represents areas outside the CBD. Their results show that firms located in the CBD are older and larger than the ones outside the CBD area. The firms located in the CBD usually use more land[8] and labour in the production process and have higher rental rates for office space. Their model suggests that agglomeration externalities increase productivity by 1-2%. These results show that relocation costs prevent establishments from moving because the gains for the individual firm are sometimes not enough. However, if external benefits such as density and agglomeration to other firms were considered, the gains might be higher than the moving costs. The authors suggest that consideration be given to subsidy or changes in government policies to help firms locate in a more efficient way.

Kimelberg & Williams (2013) study a set of possible drivers in business location decisions in the United States. In January 2005, they collected data on the importance of 39 business location factors using a four-point Likert scale (i.e., 1 = unimportant, 2 = moderately important, 3 = important, and 4 = very important). The factors were divided into six categories: (1) business environment; (2) development and operating costs; (3) labour; (4) permitting processes; (5) quality of life/social environment; and (6) transportation and access. The data represented a broad geographical spread of the United States: 25% work primarily in New England; 18% in the East Central states; 17% in the Pacific region; a 16% in the West Central and Middle Atlantic regions; 14% in the South Atlantic; and 6% in the Mountain states. They focused their analysis on three types of property: office, manufacturing, and retail. Findings suggest that there are significant differences in the factor ratings of 21 out of the 39 factors, with some uniformity in the remaining items. The factors with highest ratings for an office location were parking, rental rate, labour availability, timely permits, state incentives, crime rate, traffic and physical attractiveness. For manufacturing, the highest ratings were for labour availability, access to highways, parking, labour cost, rental rate, timely permits and state incentives. In retail, the highest ratings were for land cost, predictability, timely permits, traffic, infrastructure, rental rate and highway. Kimelberg (2014) followed up with interviews of a subset of previous respondents between November 2005 and March 2006, and found that the firms with a higher number of high-skilled workers assigned a larger weight to rates of personal crime in a potential area given that one of their concerns was retaining existing employees. The manufacturing industry did not focus as much on personal crime of the area because their recruitment strategies were focused on local labour. Although this study contained information on companies in different locations around the United

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[7] For more information visit their website http://www.dnbmdd.com/
[8] The authors state that 'Firms located in the central business district are older and larger than firms located outside the urban core. They use more land and labor in the production process. However, they face higher rental rates for office space which implies that they operate with a higher employee per land ratio.'

States, the companies that moved within regions were not differentiated from the ones that moved between regions.

Canada

Elgar et al. (2009) study business location models for new and re-locating firms in small to medium office firms (up to 100 employees) within the Toronto area in Canada. 200 managers and owners of office firms participated in the survey over eight weeks in January-March 2006 (Elgar et al., 2008). They were asked to indicate the main factors they considered when relocating, the search process used, the address of the firm in its current and previous locations, and the timing of the relocations. The authors also used Census information for the year 2001. With this information, a conditional logit model (McFadden, 1978). They consider the following factors identified from previous studies: proximity to the central business district (CBD); socioeconomic factors (e.g., population size, income); proximity to transportation infrastructure (e.g., highway ramps and train stations); and agglomeration factors (i.e., how many firms are located in the area). They also tested additional factors such as the previous location of the firm (if any) and the owner's household location. The results show that for re-locating firms, the distance to Toronto CBD, the number of buildings in the zone, the number of jobs in the zone, and the zonal density for small firms had a significant and positive influence on the business location decision. Significant and negative influences were found for the household income of the zone for architecture and engineering firms; and the distance to the firm's current location and to the owner's residential location. However, if the firm owned the building, the distance to the owner's residential location was less important than if they did not own it.

The authors estimated a different model for new firms using a sample of 140 observations. The results showed that the variables that were significant and had a positive influence on the business location decision were: the number of buildings in the zone; the number of jobs in the zone; and the number of workers employed in the zone. Oppositely, the ones that had a negative influence were the distance to the Toronto CBD and the distance to the owner's residential location. There were statistically significant differences in the models for new and for re-locating firms. One of the main differences was that first time firms took into consideration the number of employees in a zone contrarily to re-locating firms. Moreover, results show that new firms valued positively being closer to the CBD, while re-locating firms were moving away from the CBD. This study shows important differences in the key drivers for new and re-locating firms.

Australia

Linnenluecke et al. (2011) study how climate change might induce a business relocation decision. They propose a three step approach: first they assess the level of risk from climate change impacts at a firm's location; if it is high then they assess the feasibility of relocation; if the company is able to relocate then they analyse associated costs and benefits. If the benefits outweigh the costs, then the company relocates, otherwise it stays in the same location. The first case studied was with firms in the electricity distribution industry in Victoria. The data was collected as part of an investigation into the most recent major bushfires in Victoria, which is one of the most bushfire prone regions of the world. Studies on climate change suggest that, under a high emissions scenario with global warming, extreme fire danger days could increase between 100% and 300% in Victoria. Electricity infrastructure is severely affected by major bushfires, so the level of risk from climate change impacts is high. The relocation process is difficult as electricity distribution requires large infrastructure and the fact that

it provides an essential infrastructure service. The authors mention that the 2009 Victorian Bushfires Royal Commission put forward an argument to replace the existing cables with ones that are less vulnerable to bushfires and short circuits. However, it is up to the Victorian government to address the costs complications and this might take years to complete.

The second case study discusses relocation in the Australian pastoral industry which has been - and is - constantly threatened by drought. Extended dry spells and low average rainfall is relatively common in the marginal areas away from the coast and ranges, and climate change studies suggest that an ongoing change that might increase the temperatures is expected. The risk is high but the relocation is difficult as companies would need similar characteristics of land and weather to relocate. The authors argue that there is little knowledge on the costs and benefits of relocating to other regions, but it is definitely something that the beef industry in particular is taking into consideration.

China

Jiang et al. (2018) explore the relocation characteristics of the electronic and information industry in the intra-Yangstze River Economic Belt network in China. This is a first study to use percolation theory in industrial relocation, which indicates when a system is macroscopically open to a given phenomenon (Broadbent & Hammersley, 1957). The authors view the relocation process from developed regions to undeveloped regions of the manufacturing industry as a percolation process. To carry out their study, the authors collected information on location factors and transport accessibilities (defined as the average transport cost). The main location factors of manufacturing industries included production costs (i.e., transport cost, labour cost, land rent and raw materials cost), market scale, infrastructure, policy, and technology (i.e., technical spill over). Jiang (2012) performed a statistical analysis of these factors and found that the labour costs, market scale, land rent, transport cost and preferential policy are the five most important factors. Their results show that the relocation process will be accelerated due to the improvements of accessibilities and other production factors. An integrated transport network considering the waterway and highway network will accelerate the relocation process inside the region. The railway network is especially significant for the regional cluster industry. On the other hand, their results show that the bottlenecks produced in the border regions should be given more consideration when trying to accelerate industrial relocation inland.

European countries - residential location informing business location

Portnov & Schwartz (2008) argue that the key drivers in location decisions vary in time and space, and hence are relative notions. For example, closeness to an international border might be desirable in cities with open economies and low trade barriers, but not very attractive otherwise. Another example is that when a country's economy develops, the importance of the connectivity to basic resources might decrease and be replaced by other location factors. They test this hypothesis in 4,700 urban settlements across 40 European countries. The dependent variable was the annual population growth, and multiple regression models were estimated. Even though this study does not consider business location decisions but residential decisions, it is included in this study as it proposes time and space relativity which can certainly be used in business location decisions. The explanatory variables considered are population size of localities, distance to seashore, distance to the closest major city, and interaction between the location's latitude and elevation. Dummy variables representing the

different countries were also included. Their results show that when considering relative location factors instead of absolute ones, the model performance improved significantly.

International Relocation Decisions

Spain

Lampón et al. (2015) focus their study on understanding the role of competition in relocation decisions. They consider external as well as internal competition (e.g., between plants of the same company) for companies in the automobile parts manufacturing sector in Spain. They consider plants that were relocated from Spain during 2001-2008, plants that have maintained their location in Spain during this period, or plants located in Europe that belong to the same multinational as the active and relocated plants (for the inclusion of internal competition). External or internal rivalry was defined in terms of efficiency measured with a profitability marker (% return on total assets) and a productivity marker (operating revenue/costs of employees) compared to competing firms or plants in the same group, respectively. The authors consider other variables affecting relocation, such as capital ownership (foreign or domestic), plant age, number of alternative plants owned by the multinational, and the complexity of the production-process in the plant (variable calculated subject to the number of production process technologies, number of senior engineers and graduates among the total plant staff, and employees in quality functions among the total plant staff). Most of the data was available from secondary sources, except for the alternative plants and production complexity information, which was obtained by surveying members of the firms involved in these processes.

A logistic regression model was estimated to analyse the relocation decision where the dependent variable is whether the plant was relocated. Results show that the profitability indicator was not significant at a 95% confidence level when explaining relocation decisions. The productivity indicators for external and internal rivalry are both statistically significant and have a positive influence on relocation decisions, which indicates that if a plant is less efficient relative to other plants (internally or externally) there is a higher probability of the plant being relocated. Additionally, results suggest that if the number of alternative plants owned by the multinational is higher, or if the ownership of the company is foreign, the plant has a higher probability of being relocated. If the production complexity is higher or the age of the plant is higher, then the plant has a lower probability of being moved.

Others

A few other studies have looked at international relocation decisions. Contractor et al. (2010) study international relocation decisions as outsourcing and offshoring strategies. Among other considerations, the authors argue that relocation depends on the type of activities that the company undertakes: if they can be conducted inside the firm, or maybe conducted by an arms-length provider. The study provides a discussion on the organizational and geographical relocation process focused on outsourcing and offshoring.

Prange & Verdier (2011) investigate the business strategies of internationalisation. Companies are constantly confronted with a tension between exploiting existing capabilities and exploring new ones. Ambidexterity is a central theme which refers to the ability to engage in two apparently contradictory activities. The authors link this concept to the internalisation process and argue that both exploiting

existing capability and exploring new ones is a key component to a successful internationalization strategy. The focus of this study is to propose a new framework that combines these two concepts.

Baldwin & Okubo (2014) study the effect of freer trade on productivity, studied previously but without taking into consideration international relocation. They argue that the characteristics of the trade policies in the country's firm location have an effect on its productivity and also in its location decisions. Specifically, they claim that the most efficient companies will relocate and the least efficient ones will exit.