Firm migration in the Swedish wholesale trade sector.

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Abstract: This paper analyzes the determinants of firm migration in the Swedish wholesale trade sector using a unique dataset covering over 10,000 Swedish wholesale trade firms during the years 2000 – 2004. The results indicate that there are negative correlations between profits, firm age, and firm size and the probability of firm migration. Also, there is a positive correlation between firm growth in the previous year and firm migration, indicating that growth opportunities that can not be realized at the present location is an important motive for migration.

Keywords: Firm re-location, firm entry, firm demography, hierarchical random effects, logistic regression model

JEL-codes: R30, R11, L81, L22
1. Introduction

Along with new firm formation, firm exit, and firm growth, firm migration is an important part in what determines economic activity in any given region at any given point in time. Despite this, we are not aware of any studies addressing firm migration within the Swedish wholesale trade sector, although Söderman (1975) studies firm migration in general in Sweden. As such, the purpose of this paper is to study the determinants of firm migration within the Swedish wholesale trade sector.

In international research, studies of firm migration have a long history. In their seminal study of firm migration, McLaughlin and Robock (1949) describes how manufacturing firms in the US migrated from their initial location in the north-western part of the country to the south-east due to labor availability and less conflict oriented labor unions. During the period 1950 – 1980, several books and papers were written on the topic on firm migration in the manufacturing industry.¹

According to Pellenbarg et al (2002), the research focus shifted during the 1980ties from the regional to the urban level, and since most of the large scale manufacturing industry had already left city centers, focus also shifted toward migration of small-scale manufacturing, trade industries, and business services. In an early study, Pellenbarg (1976) also reported that by the end of the 1960ties, migration by wholesale trade firms had become more common than migration by industrial firms in the Netherlands. In a more recent study, Kemper and Pellenbarg (1997) report that the wholesale trade sector, together with business services, still has the highest migration rate (approximately 10% of firms in these industries migrated between 1994 and 1995) of all industries in their sample.

The question of firm migration is also important since the research from the 1990-ties and until today directed toward the “new economic geography” (e.g. Krugman, 1995; Fujita et al, 1999), and endogenous growth theory (Romer, 1990) has shown that migration and geography are important determinants of regional growth. In these models, mobility (either in labor or in firms) and large common markets are driving factors of economic growth, especially when technological change is modeled as a non-rival, partially excludable good making spillovers in technology between firms within a region possible.

¹For an excellent survey of the literature, see e.g. Pellenbarg et al (2002).
Our study contributes to the existing literature concerning firm migration in the following way. First, this is to our knowledge the first study of the determinants of firm migration within Swedish the wholesale trade sector. Second, we are able to control for the institutional and behavioral factors deemed important in the institutional- and behavioral theoretical approaches to firm migration, while focusing more closely on determinants related to the neo-classical view. As such, our study uses a neo-classical theoretical approach to firm migration, but addresses the potential problems associated with the empirical estimation of this theoretical model by using an elaborate hierarchical random effects model in the empirical part of the paper.

The results indicate that the firm specific variables deemed important in neo-classical theories of firm migration are all statistically significant, and with the expected sign. As such, there are negative correlations between profits, firm age, and firm size and the probability of firm migration. Also, there is a positive correlation between firm growth in the previous year and firm migration, indicating that growth opportunities that can not be realized at the present location is an important motive for migration.

Turning to the industry specific variables, the only significant results is that firms seem to avoid moving into municipalities where competition in their industry is already fierce. For the municipality variables the results show that firms in the wholesale trade industry seem to be migrating into less densely populated areas, and that out-migration from municipalities with a non-socialist local government are less common.

The paper is organized as follows: The next section describes the Swedish wholesale trade industry, while section 3 presents the theories of firm migration with a special focus on the neo-classical theory by Nakosteen and Zimmer (1987). Section 4 presents the data and descriptive statistics, while the empirical model to be estimated is presented in section 5. The results from the estimation of the empirical model are presented in section 6. Finally, section 7 summarizes the main results from our study.
2. The Swedish wholesale trade sector

In Sweden, previous studies has addressed the issue of new firm formation (see e.g. Bergström, 2002; Berglund and Brännäs, 1996, 2001; Daunfeldt et al, 2006; Daunfeldt et al, 2010), firm exit (Berglund and Brännäs, 1996, 2001; Bergström, 2002), and firm growth (e.g. Bergström et al, 2002; Daunfeldt et al, 2011) in the Swedish retail- and wholesale trade sectors.

In a more or less descriptive analysis, Bergström (2002) and Bergström et al (2002) reports that the Swedish retail- and wholesale trade sectors are both characterized by rapid structural change, with a high degree of new firm formation, but also with a high degree of firm exit. Also, growth in revenues is mainly reported for smaller firms, while large firms often report decreases in revenues over time. In two closely related studies, Berglund and Brännäs (1996 and 2001), find that there are large differences in entry and exit decisions between different industry sectors. For the trade and tourism sector (which includes firms in the retail- and wholesale trade industry), the most important positive determinants of firm entry is a high income level in the region of entry, as well as having access to a large labor force (measured as the share of the population being unemployed in a region). Daunfeldt et al (2006), using a zero-inflated negative binomial regression model, studies what determined entry into the Swedish retail- and wholesale trade markets between 1990 and 1996. According to their results, high returns on equity and low sunk costs attracted more entry into retail trade industries, while recent entry by other firms and higher total industry sales were associated with more local entry into both retail- and wholesale trade markets. In a related study, also incorporating uncertainty in future revenues into the analysis, Daunfeldt et al (2010) find that entry was less frequent in highly concentrated local retail food-markets characterized by a high degree of uncertainty regarding future revenues, whereas higher profit opportunities increased the probability of entry.

Turning to the question of growth in the wholesale trade sector, Bergström et al (2002) showed that the Swedish wholesale trade sector grew by an annual 7% between 1993 and 2001. Their analysis also showed that the wholesale trade sector mainly consisted of large
firms with annual revenues exceeding 25 million SEK. Contrary to the more descriptive analysis of Bergström et al (2002), Daunfeldt et al (2011) performs an analysis of the determinants of firm growth within the Swedish retail- and wholesale trade sectors. Using quantile regression models, their results show that firm growth is to a large extent explained by firm specific factors not observable for researchers using data from annual reports and other official sources (i.e. firm growth is largely explained by firm specific fixed effects), and that industry size within the municipality has a positive effect on firm growth for both the retail- and wholesale trade sector. For retailing the last result is probably due to agglomeration effects in consumer demand, while for wholesale a probable explanation is agglomeration effects in infrastructure such as railroads and highways.

3. Theoretical background

Following Hayter (1997), we divide the theories of firm migration into three general types; a neo-classical-, a behavioral- and an institutional approach. Our study will use the neo-classical theoretical approach put forward by Nakosteen and Zimmer (1987) to discuss the different causes of firm migration. We will, however, in the empirical part of the paper also control for time-invariant institutional differences between local decision making units (municipalities), as well as unobservable heterogeneity affecting migration decisions at the firm level (such as, for example, bounded rationality of firm decision makers). As such, our empirical model is set up to control for as much observable and unobservable heterogeneity as possible, given the available data.

Following Nakosteen and Zimmer (1987), we assume that the firm’s goal is to maximize profits and that the individual firm is a price taker in both product and factor markets. Firm \(i\), active in industry \(m\), at time \(t\) thus have the following profit function:

\[
E_{int} = E(X_i, K_j, Z_m, \epsilon_{int}) \quad (1)
\]

† Approximately 3.9 million USD or 2.7 million EURO. Exchange rates 9/6 2011: 6.39 SEK/USD and 9.36 SEK/EURO.

‡ These three theoretical approaches have usually been developed as theories for the optimal location of firms, with the re-location of firms as a special case. These three types have, however, also been used as a theoretical basis for studying firm re-location decisions (e.g. Pellenbarg et al, 2002).

§ The potential endogeneity of independent variables will be addressed in the empirical part of the paper.
where $X_i$ represents firm specific variables, $K_j$ denotes variables related to industry $j$, and $Z_m$ are location (municipality) specific variables, all affecting expected profits. Finally, $\varepsilon_{itm}$ is a residual term reflecting, for example, random optimization errors at the firm level. Firms in industry $j$ continuously monitor their profits relative to a fixed minimum target threshold, $E_j$, and if expected profits at the current location is driven below this threshold, i.e. if

$$E_{itm} < E_j$$  (2)

this will trigger a migration decision. Note that this also means that as long as expected profits exceeds the threshold level, firms will stay at their current location, even if there might be other locations with even higher levels of the expected profits. The motivations for this is that firm migration is always associated with (sometimes substantial) costs, and that there could be capital inertia where buildings and machinery at the current location may be written off, while still being operational at low costs (Auty, 1975).

Although our main theoretical motivation in this paper is based on the neo-classical model of Nakosteen and Zimmer (1987), other theoretical approaches to firm migration also deserve some discussion. First, the behavioral model of firm location is based on the idea of bounded rationality (Simon, 1955; 1959). These models assumes that decision makers within the firm does not always have access to all relevant information, and that decisions are often characterized by limited levels of rationality. In the empirical part of the paper, we will assume that the level of rationality of the decision makers in the firm is fairly constant over the relatively short time period under study (2000 – 2004), and use firm specific random effects to capture heterogeneity among firms in the level of rationality in their decision to re-locate or not.

Second, the institutional models of firm location focuses not only on firm behavior but also at the social and political context in which the location and migration decisions are taken. According to Pellenbarg (2002), there are two important types of institutions affecting relocation decisions of firms; local governments and local real-estate markets. In Sweden, these two are often closely related to each other since local governments can use the Swedish plan-

** In practice, the firm could of course use other strategies to achieve the target level of expected profits. However, in order to focus on the decision to re-locate we disregard other potential strategies in the theoretical section of the paper.
and building act to hinder (or at least delay) entry by new firms into the region. In order to take heterogeneity among Swedish municipalities into account, we will assume that the impact on in-migration of firms by local governments and local real-estate markets have also been fairly constant over the relatively short period under study. We thus introduce municipality level random effects to control for municipality level heterogeneity in these institutions.

4. Data and descriptive statistics

In this study, a dataset covering all limited liability firms in Sweden has been provided by MM Partner. All limited liability firms registered in Sweden are legally obligated to submit their annual reports to the Swedish Patent and Registration Office (PRV). The collected data, compiled by MM Partner, are used in this study to measure several firm- and industry specific variables of interest, and these data are frequently used in research (e.g. Daunfeldt et al, 2010; Daunfeldt et al, 2011). In addition, data measuring municipality level variables such as population density and the political preference in the municipality has been supplied by Statistics Sweden.

The original dataset consists of data from 288,757 firms from all sectors of the economy, being active at some point in the period 1995-2005. Thus, for the purpose of this paper, the original size of the data set was reduced in several steps. We have chosen to focus our analysis on the Swedish wholesale trade industry during the period 2000-2004; the years prior to 2000 were left out since reliable data on firm migration was not available.

As mentioned, only firms being active in the wholesale trade sector were included, and the identification was done using the NACE classification of economic activity. As we are interested in the geographical location and migration of firms, only firms having a registered visitor’s address were included in the study. Mail order- and internet based firms were left out of the analysis. Also, the original dataset contained both single and multi-plant firms. However, the nature of the annual reports data does not allow in-depth analysis of multi-plant firms, and therefore, we have chosen to focus our study on single plant firms only. It should however be noted that previous studies of firm migration has indicated that single

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†† The annual financial reports data are aggregated to the main office (HQ) and for firms having more than one production place, it is impossible to distinguish how each plant contributes to the final results.
plant firms adopt different migration strategies, as compared to larger multi-plant firms (Pellenbarg et al, 2002).

In total, the data set consists of 13,471 wholesale trade firms, being active at least some point during in the years 2000-2004. Then, since observations are missing for one or more of the variables in the regression model, and several of the independent variables have been lagged one year to reduce the risk of reversed causality bias, this reduces the sample by 2,591 firms, leaving a dataset of 27,627 observations in an unbalanced panel of 10,880 firms to be used in the empirical estimations below.

Firm migration in this study is defined as a change of firm´s residence address beyond the municipality border. The study adopts the Swedish administrative division from the year 2000 with 289 municipalities.

The spatial distribution of wholesale trade firms in Sweden is illustrated in figure 1. The majority of firms are concentrated in the southern part of the country and particularly in the three metropolitan regions of Stockholm, Gothenburg and Malmö. The Stockholm metropolitan region has the largest firm population with almost 1/3 of the total population of wholesale trade firms, while Gothenburg and Malmö represents 14.5% and 8% of all wholesale trade firms, respectively. In the northern part of the country, the existing wholesale trade firms are mainly concentrated in the coastal regions, and in the proximity to more densely populated cities. This distribution of wholesale trade firms mainly follows the broader urbanization patterns of Sweden, with an overrepresentation of industries in the three largest metropolitan areas.

Out of the total number of 13,471 firms included in the sample, there were 1870 migration cases identified in the period 2000 to 2004. This migration mobility represents an average of 3.5% of existing firms re-locating each year. This could be compared to the numbers presented in Kemper and Pellenbarg (1997), where 10.1% of wholesale trade firms in the Netherlands migrated in the year 1995. Of these, 2.7% migrated to a new chamber of commerce district, and are thus considered long distance migration by the authors.
If we turn to the spatial patterns of firm mobility, figure 2 illustrates the migration intensity calculated at the municipality level. The average number of in-migrating and out-migrating firms for each municipality in the period 2000-2004 is here related to the number of existing firms. Note that there are apparent regional differences in the migration intensity; however no distinct spatial similarities can be identified. The migration mobility for the majority of the municipalities is below the average value of 3.5% of annually moving firms; and these municipalities are spread evenly across the country. However, areas with higher migration intensity can also be identified – several municipalities in the northern part of the country, the metropolitan areas, municipalities in the coastal areas of Skåne and Halland, and the area south of Stockholm.
Figure 3 shows which municipalities gained and lost firms as a result of firm migration. Out of 289 Swedish municipalities, 128 had a migration surplus, while 95 municipalities had a migration deficit and 66 municipalities had balanced firm migration in the wholesale trade industry. In light of figure 2, we have already mentioned that there no clear spatial patterns concerning the migration intensity. However, from figure 3 it might be concluded that the inner parts of the metropolitan areas of Stockholm and Gothenburg both encountered a migration deficit. The municipality of Stockholm had the highest deficit with the loss of 53 firms, while Gothenburg lost 37 firms during the years under study. These municipalities are then followed by Sollentuna and Lidingö, both located in the inner parts of the capital of Stockholm. Contrary to the migration deficit of the inner parts of the metropolitan regions, the surrounding municipalities have increased the number of firms.
Table 1 reports means and standard deviations for all variables included in the empirical analysis, divided into migrating and non-migrating firms. The migrant firms are smaller in size compared to the non-migrating firms, and they are also younger. Similar results concerning the firm size of migrating firms were reported from the Netherlands (Pellenbarg (2002), the United States (Nakosteen and Zimmer, 1987), and the United Kingdom (Mariotti and van der Steen 2001), all measuring size by the number of employees in the firm. In addition, the return on assets (ROA) and firm growth in the period prior to migration were both negative for migrating firms, while positive ROA of non-migrating firms. This indicates that firms having encountered negative results might choose migration as a strategy in order to increase profits.
Table 1: Descriptive statistics, variables measured at the firm level

<table>
<thead>
<tr>
<th>Variable</th>
<th>Migrating firms</th>
<th>Non-migrating firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Std. Dev.</td>
<td>Mean Std. dev</td>
</tr>
<tr>
<td>ROA_{it-1}</td>
<td>-3.79 73.58</td>
<td>3.05 51.42</td>
</tr>
<tr>
<td>Firm age_{it-1}</td>
<td>12.95 8.94</td>
<td>14.80 9.10</td>
</tr>
<tr>
<td>Firm size_{it-1}</td>
<td>14245.01 57817.52</td>
<td>21740.38 140627.30</td>
</tr>
<tr>
<td>Firm growth_{it-1}</td>
<td>-0.15 1.74</td>
<td>-0.029 1.64</td>
</tr>
</tbody>
</table>

Table 2 provides means and standard deviations for all industry- and region specific variables for out- and immigration municipalities, respectively. The minimum efficiency scale (MES), measured as the total sales of the average firm in the industry j and municipality m, is almost identical for both groups of municipalities. Other industry specific variables are industry size measured as the total sales in industry j and municipality m, and the number of firms in industry j located in municipality m. To control for competition in the local market, market concentration in each 5-digits industry j in municipality m has been measured using a Herfindal index. A Herfindal index is measured as the sum of squared market shares of each of the firms i located in the municipality m and industry j. The Herfindal index is defined on the interval 0 to 1, and has a value equal to 1 if only one firms operates in the local market; municipalities with two firms with an equal share of the local market have the value 0.5 etc. Note that the descriptive statistics show that, on average, there are two wholesale trade firms within a specific industry and municipality in Sweden.

Table 2: Descriptive statistics, variables measured at the municipality level, migrating firms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outmigration municipalities</th>
<th>Immigration municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Std. Dev.</td>
<td>Mean Std. dev</td>
</tr>
<tr>
<td>MES_{jt-1}</td>
<td>24809.01 57927.50</td>
<td>25202.92 60103.86</td>
</tr>
<tr>
<td>Industry size_{jt-1}</td>
<td>722512.10 1500048.00</td>
<td>725667.10 1520346.00</td>
</tr>
<tr>
<td>Firms_{jt-1}</td>
<td>28.37 50.41</td>
<td>28.18 50.13</td>
</tr>
<tr>
<td>Herfindahl index_{jt-1}</td>
<td>0.48 0.33</td>
<td>0.47 0.32</td>
</tr>
<tr>
<td>Population density_{mt-1}</td>
<td>1205.20 1468.42</td>
<td>1049.30 1408.68</td>
</tr>
<tr>
<td>Non-socialist_{mt-1}</td>
<td>0.33 0.47</td>
<td>0.34 0.48</td>
</tr>
</tbody>
</table>

The main conclusion to be drawn from the descriptive statistics for the industry specific variables presented in table 2 is that in- and outmigration municipalities show only marginal
differences with respect to these variables. Finally, the regional-specific variables included in the study contain population density and a dummy variable equal to one for a non-socialist local government. Higher population density in out-migration municipalities indicate that firms are more frequently moving from more to less densely populated areas. This also confirms the pattern presented in figure 2 above, that densely populated metropolitan areas have a migration deficit for wholesale trade firms.

Finally, table 3 is a table reporting means and standard deviation for the full dataset used in the estimation of the two empirical models estimated below. Variables measured on the firm level are identical in both models, while industry- and municipality specific variables differ between outmigration- and inmigration municipalities. However, since most firms do not relocate during the period under study, all reported numbers are quite similar for the two datasets.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outmigration municipalities</th>
<th>Inmigration municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std.dev.</td>
</tr>
<tr>
<td>ROA_{it-1}</td>
<td>2.81</td>
<td>52.39</td>
</tr>
<tr>
<td>Firm age_{it-1}</td>
<td>14.74</td>
<td>9.10</td>
</tr>
<tr>
<td>Firm size_{it-1}</td>
<td>21467.05</td>
<td>138487.10</td>
</tr>
<tr>
<td>Firm growth_{it-1}</td>
<td>-0.032</td>
<td>1.64</td>
</tr>
<tr>
<td>MES_{jt-1}</td>
<td>21840.24</td>
<td>59202.27</td>
</tr>
<tr>
<td>Industry size_{jt-1}</td>
<td>650098.20</td>
<td>1386122.00</td>
</tr>
<tr>
<td>Firms_{jt-1}</td>
<td>27.95</td>
<td>49.62</td>
</tr>
<tr>
<td>Herfindahl index_{jt-1}</td>
<td>0.48</td>
<td>0.33</td>
</tr>
<tr>
<td>Population density_{mt}</td>
<td>1005.33</td>
<td>1422.01</td>
</tr>
<tr>
<td>Non-socialist_{mt}</td>
<td>0.26</td>
<td>0.43</td>
</tr>
</tbody>
</table>

There are two reasons for dividing the data and the empirical estimations into two different models, one using data from the out-migration municipalities and the other from the in-migration municipalities. First, firm migration has often been studied as a two stage process where factors at the current location affect the decision to move, while factors at the in-migration location affect the decision of where to move (see e.g. Pellenbarg 2002, p114-116.). Second, since the majority of firms do not move, the variables calculated at the municipality level will be highly co-linear, making it impossible to use data from both out-migration and in-migration municipalities in the same econometric model.
5. Empirical model

From the theoretical section we know that if expected profits at the current location is driven below the threshold value, i.e. if the firm faces a situation when

$$E_{itm} < E_j$$ \hspace{1cm} (3)

this will trigger a migration decision. As such, we can formulate a latent response model where the observed dichotomous decision to re-locate the firm, $R_{itm}$, is caused by the expected loss if staying at the current location as opposed to re-locating the firm. The observed latent response can thus be written;

$$R_{itm} = 1 \text{ if } E_{itm} < E_j, \text{ 0 otherwise.} \hspace{1cm} (4)$$

We can now formulate the following logistic regression model

$$R_{itm} = c_0 + c'T + \rho X_i + \eta K_j + v Z_m + \varepsilon_{int} \hspace{1cm} (5)$$

where $R_{itm} = 1$ if firm $i$ re-locates at time $t$, zero otherwise. $c_0$ is a constant term, and $T$ is a vector of time specific fixed effects included to capture time-variant heterogeneity in firm migration behavior. $X_i$ represents firm specific variables, $K_j$ denotes industry specific variables, while $Z_m$ are location (municipality) specific variables. Finally, $\varepsilon_{int}$ is the residual (or heterogeneity) term, which can be written;

$$\varepsilon_{int} = \xi_{im} + \zeta_i + \xi_{int} \hspace{1cm} (6)$$

Substituting (6) into (5) results in the following three-level random intercept logistic regression model with time specific fixed effects, where time periods $t$ are nested in firms $i$ which are in turn nested in locations $m$. The model is thus set up to control for unobservable heterogeneity at the time, municipality and firm level.

$$R_{itm} = c_0 + c'T + \rho X_i + \eta K_j + v Z_m + \xi_{im} + \zeta_i + \xi_{int} \hspace{1cm} (7)$$
Equation (7) is then estimated using the gllamm command in STATA, and when estimating equation (7) we expect the following. Regarding the vector of firm specific variables, $X$, we include return on assets ($ROA_{it-1}$), growth ($Firm\ growth_{it-1}$), age ($Firm\ age_{it-1}$) and size ($Firm\ size_{it-1}$) in the estimations. Following Daunfeldt et al (2006, 2010) all firm- and industry specific variables have been lagged one period. Lagging the industry specific variables corresponds directly to the potential migrant firm’s decision problem since these firms only have access to the other firms annual reports used to calculate the industry specific variables with a one year time lag. Lagging the firm specific variables also alleviates a possible reversed causality problem, since previous years’ values are, by definition, predetermined.

First, we expect there to be a negative correlation between profitability in the previous year, measured as return on assets, $ROA_{it-1}$, and the probability of firm migration. This follows from the theoretical model set up by Nakosteen and Zimmer (1987), but could also be motivated from the descriptive statistics presented above. Also, a survey of firms in the Netherlands in 1998 (BIC, 1998) found that “Business economic reasons” were reported as the primary reason for re-locating by 16.7% of respondents.

We also expect there to be a positive correlation between growth in the previous year, $Firm\ growth_{it-1}$, and firm migration. This is so since several previous studies (e.g. Pellenbarg, 1995; Louw, 1996; BIC, 1998) have reported a need for expansion that could not be accommodated at the current location as the main motive for the migration of firms.

Following Brouwer et al (2004), the firm specific variables also include firm age, $Firm\ age_{it-1}$, and firm size measured as revenues in the previous year, $Firm\ Size_{it-1}$. The motivation for including firm age is that older firms are more embedded in the local spatial environment (e.g. Putnam, 1993), while there are several reasons for including firm size. First, migration costs are more substantial for large firms, and smaller firms usually have less demanding premise requirements (Brouwer et al, 2004). Second, smaller firms can not affect the restrictions imposed on them by policymakers in the same way large firms can, and firm migration can then be an alternative (Hayter, 1997).

Turning to the vector of industry specific variables, $K$, these include the minimum efficient scale ($MES_{jt-1}$) in the industry in the previous year, industry size ($Industry\ size_{jt-1}$), the number
of firms \((Firms_{jt-1})\), and an Herfindahl index \((Herfindahl\ index_{jt-1})\) measuring the degree of competition in the local market.

Following Daunfeldt et al (2011), MES is measured as the size of the average firm in the industry \(j\) and municipality \(m\) at time \(t-1\). The reason for including this is that if the minimum efficient scale of operations is large, a firm entering a new market must be certain to reach a profitable scale in a short period of time (e.g. Strotman 2007, p.89). As such, we expect a negative correlation between the minimum efficient scale and the decision to re-locate the firm, ceteris paribus.

The size of the market is proxied by two variables, Industry size \((Industry\ size_{jt-1})\) and the number of firms \((Firms_{jt-1})\). Industry size is measured using total sales for industry \(j\) in municipality \(m\). We also control for the size of the market by using the number of firms active in a specific industry \(j\) located in municipality \(m\). Following Brouwer et al (2004) and Caves and Porter (1976), we expect there to be a positive correlation between the probability of firm migration and the size of the market.

Finally, we measure the degree of competition in the local market by using a Herfindahl-index. Previous studies (e.g Daunfeldt et al, 2010) have shown that there is a negative correlation between highly concentrated local markets and entry by retail trade firms. We would expect that the same would hold for in-migration of wholesale trade firms into local markets.

\(Z_m\) is a vector of location (municipality) specific variables such as population density \((Population\ density_{mt})\) and an indicator variable for having a non-socialist local government \((Non-socialist_{mt})\). Population density is included since Pellenbarg et al (2002) report that during the 1980-ties there was a suburbanization of firms due to space shortages, increasing land prices and growing congestion on roads in urban areas. For the wholesale trade industry all of these factors can harm profitability, and thus we expect Swedish wholesale trade firms to re-locate to less densely populated areas.

Institutions like local governments can also affect the migration decisions of firms. For example, local governments have the authority to use the Swedish plan- and building act to hinder (or at least delay) entry by new firms into the region. Previous studies of entry in the
retail trade industry in Sweden (e.g. Daunfeldt et al., 2010) have therefore included indicator variables for non-socialist local governments. Their results show that more entry occurred in municipalities with non-socialist local governments, suggesting that this type of institutional factors have an effect on entry.

Finally, the empirical model includes random effects on the municipality ($\zeta_{im}$) and firm level ($\zeta_i$). These are included to capture all time invariant municipality and firm level heterogeneity not captured by the variables discussed above. For example, the impact of local real estate markets on the decision to re-locate the firm should be captured by the municipality random effects, as long as these markets have been fairly constant over the period under study. The firm level random effects should capture such non-observable firm characteristics as the degree of rationality in management, firm culture, skills of the employed, etc, as long as these are also fairly constant during the time under study.

6. Estimation results

The results from the estimation of equation (7) for one model where all industry- and municipality specific variables have been calculated for the out-migration municipality, and another where the same variables have been calculated for the in-migration municipalities, are presented in Table 4.

Starting by discussing the results from the first model, related to the out-migration municipalities, we find the following. First, as predicted by theory (Nakosteen and Zimmer, 1987) and found in the 1998 survey of firms in the Netherlands (BIC, 1998), there is a negative correlation between return on capital in the previous year, and the probability of firm migration. Second, regarding firm size and firm age there is also a negative correlation between these variables and the probability of migration. As such, our findings are along the lines of previous studies (e.g. Putnam, 1993; Hayter, 1997; Brouwer et al., 2004). Third, for out-migration municipalities, firm growth has a positive correlation with the probability of migration. As such, previous findings, that a need for expansion that could not be accommodated at the current location is an important motive for firm migration, are confirmed by our study (Pellenbarg, 1995; Louw, 1996; BIC, 1998). For in-migration municipalities the results are similar, with the exception that firm growth does not have any significant correlation with firm migration.
Table 4: Estimation results, probability of migration, 2001-2004

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outmigration municipalities</th>
<th>Immigration municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Std.err</td>
</tr>
<tr>
<td>ROC(_{it-1})</td>
<td>-0.0012</td>
<td>0.00064</td>
</tr>
<tr>
<td>Firm age(_{it-1})</td>
<td>-0.020</td>
<td>0.0031</td>
</tr>
<tr>
<td>Firm size(_{it-1})</td>
<td>-8.93E(-7)</td>
<td>-4.40E(-7)</td>
</tr>
<tr>
<td>Firm growth(_{it-1})</td>
<td>0.062</td>
<td>0.027</td>
</tr>
<tr>
<td>MES(_{jt-1})</td>
<td>1.28E(-7)</td>
<td>6.74E(-8)</td>
</tr>
<tr>
<td>Industry size(_{jt-1})</td>
<td>-1.54E(-6)</td>
<td>-3.70E(-6)</td>
</tr>
<tr>
<td>Firm(_{jt-1})</td>
<td>0.00073</td>
<td>0.00099</td>
</tr>
<tr>
<td>Herfindahl index(_{jt-1})</td>
<td>0.029</td>
<td>0.10</td>
</tr>
<tr>
<td>Population density(_{mt})</td>
<td>-2.38E(-6)</td>
<td>0.000030</td>
</tr>
<tr>
<td>Non-socialist(_{mt})</td>
<td>-0.24</td>
<td>0.084</td>
</tr>
</tbody>
</table>

Random effects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variance</th>
<th>Std.err</th>
<th>Variance</th>
<th>Std.err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality((\zeta_{i}))</td>
<td>0.095</td>
<td>0.028</td>
<td>***</td>
<td>0.71</td>
</tr>
<tr>
<td>Firm((\zeta_{im}))</td>
<td>0.17</td>
<td>0.098</td>
<td>*</td>
<td>0.0019</td>
</tr>
</tbody>
</table>

* statistically significant at the 10% level. ** statistically significant at the 5% level. *** statistically significant at the 1% level. Time specific fixed effects not reported to save space.

Turning to the industry specific variables, none of these are statistically significant at conventional levels in the model for out-migration municipalities. For in-migration municipalities, there is a negative correlation between the Herfindahl index measuring market concentration and the probability of in-migration. As such, in-migrating firms seem to avoid local markets where competition within the industry is already fierce. This finding is then along the lines of Daunfeldt et al, 2010 who showed the same result for entry into local retail trade markets.

The results for the variables measured at the municipality level, population density and the indicator variable for having a non-socialist government, for out-migration municipalities show that there is a negative correlation between being located in a municipality governed by a non-socialist majority and subsequent firm migration. The results for in-migration municipalities show that there is a negative correlation between having a high population density and out-migration by firms. The findings discussed in Pellenberg et al (2002), that firms during the 1980ties left densely populated urban areas due to space shortages,
increasing land prices and growing congestion on roads, thus seem to hold also for migration over municipality borders of wholesale trade firms in Sweden during the years 2001-2004.

Finally, the municipality- and firm specific random effects show that there is unobserved heterogeneity at both levels for the data from out-migration municipalities, while only the random effect for municipalities is statistically significant at conventional levels for the model using data for the in-migration municipalities. As such, there is non-observable time-invariant heterogeneity between municipalities and firms affecting the migration decision of firms, and this should be accounted for in empirical studies. Not doing so would lead to missing variable bias.

7. Summary

A careful examination of the literature showed that firm migration has not been studied extensively in Sweden, with the exception of Söderman (1975). In fact, no previous study of firm migration within the wholesale trade sector was found, even though wholesale has been one of the sectors where firm migration has been most common (e.g. Kemper and Pellenbarg, 1997). As such, the purpose of this paper is to study the determinants of firm migration in the Swedish wholesale trade industry.

The results show that the firm specific variables deemed important in neo-classical theories of firm migration are all statistically significant, and with the expected signs. Our analysis thus seem to confirm previous results (e.g. Nakosteen and Zimmer, 1987; Putnam, 1993; Pellenbarg, 1995; Louw, 1996; Hayter, 1997; BIC, 1998; Brouwer et al, 2004) regarding the importance of profits, firm size, firm age and firm growth in explaining firm migration patterns.

Turning to the industry and municipality specific variables, the only significant results for the industry specific variables is that firms seem to avoid moving into municipalities where competition in their industry is already fierce. For the municipality variables the results show that firms in the wholesale trade industry seem to be migrating into less densely populated areas, and that firm migration is less common from municipalities with a non-socialist local government.
Finally, the municipality- and firm specific random effects show that there is unobserved heterogeneity at both levels for the data from out-migration municipalities, while only the random effect for municipalities is statistically significant at conventional levels for the model using data for the in-migration municipalities. This indicates that there is non-observable time-invariant heterogeneity between municipalities and firms affecting the migration decision of firms, and this should be accounted for in empirical studies.

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References


