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„Entry and Competition: The case of Austrian Driving
Schools and Notaries“

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1. Introduction

Competition is an important pillar of modern market economies. It is a major key to an effective allocation of goods, the maximization of social welfare and an improvement of consumer surplus and wealth. Moreover, it motivates firms to invest in innovations and research activities, which ensures long term economic growth.

The impact of competition on market outcomes has been investigated intensively in the traditional structure-conduct-performance approach. However, it is well known that market structure is not exogenous to the competitive process. Market structure is determined by the entry and exit decisions of individual firms which are affected by expectations of future profits. Expected profits, in turn, depend on the nature of competition within the market. More recent research in Industrial Organization (IO) focuses on the theoretical and empirical analysis of firms' entry decisions. By studying firms' entry decisions economists can gain important insights into the nature of competition: "By observing how firms' decisions change, as their choice sets and market conditions change, IO economists can gain insight into the underlying determinants of firm profitability, ... , and the nature of competition itself" (Berry and Reiss, 2007, p. 1850).

This thesis investigates the degree of competition in two Austrian retail markets by analyzing the competitive effects of entry. The empirical results will be based on the entry competition model by Bresnahan and Reiss. In a series of papers, Bresnahan and Reiss (1990, 1991) develop a framework to measure the degree of competition with modest data requirements. Basically, Bresnahan and Reiss collect data on the number of firms and the market size (number of potential consumers) to draw inferences about firms' unobservable price-cost margins and the intensity of competition among firms.

Their approach is highly intuitive. Assuming identical firms, a new market entrant requires at least the same number of potential consumers as the incumbents to realize profits larger than zero. However, if additional entry intensifies competition, a larger number of firms will decrease prices, which again raises the number of potential consumers per firm needed to break even. In other words, the market size has to increase disproportionately to support new entrants. Chapter 3.1. will review the model in greater detail.

The empirical part of this thesis will test this disproportional increase in two different ways. First of all, we will apply a Tobit model to investigate the general impact of the market size on the number of firms. Furthermore, the Tobit model will also include different control variables (e.g. unemployment rate, share of foreigners and so on) which describe a market, since we know that the number of firms is not only based on the number of potential consumers but also on their characteristics. The second empirical part is the core of this thesis. This section will estimate the entry threshold and the entry threshold ratios. Entry thresholds are the number of potential customers needed for a single firm to break even. These entry thresholds will be estimated for every number of firms (monopoly, duopoly and so on) in both markets. Ratios of these different entry thresholds will then provide information about the degree of competition. The entry threshold estimation process will be described in Chapter 3.2. Chapter 5 will present the empirical results.

The thesis applies the Bresnahan and Reiss (1991) framework in two different markets: the Austrian notary and driving school market. These markets were selected for three reasons: First, previous studies for other countries have already investigated the relationship between competition and firm entry in these markets,¹ which allows us to compare the results for Austria with those obtained for other economies. Secondly, both occupations compete in relatively homogenous markets; hence firms face similar cost structures, which is one of the main assumptions in the Bresnahan and Reiss approach. And finally, both markets show substantial differences in the level of regulation. Entering the notary market is comparatively difficult, since the Austrian ministry of justice regulates the number and location of all notaries in Austria. In contrast, the driving school market is a market with little restrictions. By comparing the results for the two markets, the thesis also provides some insight into the impact of regulation on the relationship between market entry and competition, which is also interesting for other industries.

¹ Nahuis and Noailly (2010) for the notary market in the Netherlands and Asplund and Sandin (1999a) for driving schools in Sweden.

2. Literature Overview

2.1. Summary Theory

Although competition provides positive consequences for most parts of society, markets are not competitive ex ante. Industrial Organization theory predicts that especially firms in small markets are prone to non-competitive behavior. Firms engage in collusion, form cartels or crowd out smaller competitors from the market when they experience economies of scale.

These deviations from competitive behavior call for institutions to supervise and regulate markets and ensure competition. Competition authorities are common practice in modern market economies. Examples include the 'Österreichische Bundeswettbewerbsbehörde' (Austria), the 'Federal Trade Commission' and the 'U.S. Department of Justice Antitrust Division' (United States), the 'Bundeskartellamt' (Germany) or the 'Autorité de la concurrence' (France) (Federal Trade Commission, 2013). Their responsibilities are complex and the specific institutional details differ between countries. Most competition authorities mainly engage in competition law enforcement but also conduct consumer protection, regulation of mergers and business alliances and supervision of cartels and monopolies.

To pursue their duties, authorities as well as researchers need tools to measure the level of competition in a market. In economic theory, defining the level of competition is straightforward. Industrial Organization theory provides simple and accurate measures of competition. When firms' prices equal marginal costs, markets are described as perfectly competitive. In the opposite extreme situation (monopoly), markets are served by a single firm only and the costs of entry are prohibitive. Oligopolies are non-perfectly competitive markets consisting of more than one firm. In an oligopoly, prices exceed marginal costs and firms realize positive price-cost margins.

Problems arise when researchers or regulators seek to identify the level of competition empirically. Most approaches to determine the level of competition focus on the size of a firm's margin between price and marginal costs. Unfortunately, marginal costs are generally unobservable for third parties and difficult to assess for firms themselves. Even researchers with inside access to accounting data on costs face difficulties, since accounted costs are

often inadequate indicators for the theoretical construct of marginal costs (Bresnahan, 1989).

Researchers have been very creative in developing different approaches to overcome this problem (lack of information on marginal costs) and investigate the intensity of competition. This chapter will provide a brief summary of the different approaches and developments in this field over time. More specifically, we bear on papers by Einav and Levin (2010), Berry and Reiss (2006) and the book of Perloff et al. (2007), which provides a fruitful theoretical background.

Economists have long been interested in the economics of competition. In the early days of Industrial Organization, researchers were faced with two major problems: a lack of theoretical models to discuss non-competitive markets and insufficient good data to test the theoretical models. According to Einav and Levin (2010), the first challenge was tackled during the 'game theory revolution' in the 1980ies, when models were established that integrated issues like entry barriers, product differentiation and pricing strategies and allowed a more detailed modeling of individual firms' behavior.

Theoretical models in Industrial Organization can be classified into static and dynamic models. In static models, all decisions are made within one period (simultaneously). In dynamic models, on the other hand, firms interact over several periods and maximize their expected present discounted profit over time. The relevant decisions are made and described in different stages of the game. In a two-stage entry game, for example, the first stage consists of a firm's decision whether to enter or not. In the second stage, the firms which decided to enter the market in the first stage compete with each other (Berry and Tamer, 2006).

First empirical studies in Industrial Organization were conducted in the early 1950ies by different researchers, particularly Bain (1951) among others. They used the so called 'Structure-Conduct-Performance (SCP)' approach, which investigates the relationship between variables to characterize market power (e.g. profit of firm) and indices of market structure (e.g. market share of the four biggest firms) for a cross-section of different industries. From comparing the results of specific industries with the outcome of other industries, researchers draw conclusions about competition.

Of course, the SCP approach has notable limitations. First of all, this cross-industry approach does not adequately consider structural differences between industries. The institutional environment, regulatory restrictions, as well as cost and demand conditions will differ between industries and ignoring these industry differences might lead to biased results. Einav and Levin (2010) also point out that the accounting measurements of economic profits in these studies were not elaborate enough to represent true economic revenues. Moreover, most studies were not capable of identifying causal effects.

During the second half of the 1980ies, empirical studies based on imperfect competition models shifted from cross-industry to single industry observations. Economists now believe that studying individual firms within a single industry would provide enough information and would solve some of the afore mentioned problems to justify focusing on one industry rather than a sample of industries. Instead of comparing industries, researchers now focus on one industry and its specific cost, demand and market characteristics. Thereby, they extensively involve economic theory to gain knowledge about firms' behavior. Bresnahan (1989) labeled this new approach 'New Empirical Industrial Organization'.

Like the early cross-industry research, parts of this new approach are also exposed to criticism. Single industry research results are narrow and specific to one market and generalizing findings is very difficult. However, single industry research can still facilitate innovations to benefit the entire field of Industrial Organization in two different ways: First, it can introduce new empirical methods, tested in one industry sector, that are applicable to other industries as well. Further, it can describe specific behaviors in one industry, e.g. a firm's price reaction to the entry of an additional firm, and translate these findings into a general case (Einav and Levin, 2010).

The 'New Empirical Industrial Organization' approach also found its way into competition theory at the beginning of the 1990ies, when researchers started examining the effects of entry on competition in single markets. The major approach was introduced by the pioneering work of Bresnahan and Reiss (1991). Bresnahan and Reiss basically compare the number of firms and market size (number of potential consumers) to draw conclusions about firms' underlying price-cost margins which define the level of competition. The model will be presented in greater detail in the following chapter.

Bresnahan and Reiss (1991) choose several U.S. retail markets, e.g. plumbers, druggists and opticians to apply their model. Many other researchers have utilized the Bresnahan and Reiss framework to study other markets like the 19th century American brewing industry (Manuszak, 2002), the Belgian pharmacy and physician market (Schaumans and Verboven, 2008), the U.S. motel market (Mazzeo, 2002), the Swedish market of driving schools (Asplund and Sandin, 1999a), the U.S. banking sector (Certorelli, 2002) and the U.S. hospital industry (Abraham et al., 2005), among others. Some of the mentioned papers will be discussed in the following chapter.

The Bresnahan-Reiss approach did not experience many modifications. One notable modification was introduced by Mazzeo (2002), who added endogenous product choice to the basic model. Mazzeo's model estimates the number of firms and predicts the product type each firm chooses in a differentiated market. The author applies the model in the U.S. motel market, where each firm can decide about the product's quality. Apart from that, most researchers still apply the classic Bresnahan-Reiss model from 1991. Hence I will focus on other strategies used in empirical work to study competition in the remaining chapter. Some alternative approaches will briefly be described here.

A common strategy used in empirical Industrial Organization to investigate changes in competition after entry is to ignore costs and focus on price movements only. Prices are usually observable parameters (like market size or the number of firms) and data problems should not occur. A recent paper by Golsbee and Syverson (2008) treats price movements as competition indicators and studies the effect of Southwest Airlines entering specific U.S. flight routes on the incumbents' prices. Golsbee and Syverson observe a strong decline in incumbents' prices, thus they conclude a substantial competition increase due to entry. Furthermore, Golsbee and Syverson focus on the incumbents' response to the simple entry threat of Southwest on a specific route. In this regard, Golsbee and Syverson make reference to the contestable markets theory, introduced by Baumol (1982).

The contestable markets theory is one of the cornerstones of competition theory. The theory predicts that potential entrants can discipline an incumbent, which implies that even markets with a small number of firms (and even monopolies) can be perfectly competitive, provided that entry is easy. Golsbee and Syverson (2008) provide some empirical evidence

in favor of the contestable markets hypothesis by observing a significant number of incumbents, which execute price cuts on routes where Southwest threatens to enter the market.

Boone (2008) suggests an approach to measure the level of competition, which does not involve measuring prices and price-cost margins. He refers to theoretical papers by Rosenthal (1980) and other authors (e.g. Bulow and Klemperer (1999)), who claim that increased competition can imply larger price-cost margins. To avoid this possible ‘anomaly’, Boone introduces a new measure called the relative profit difference. The relative profit difference consists of firms’ variable profits and efficiencies.

Boone (2008) illustrates his approach by describing an industry where every firm is characterized by one of three different efficiency levels $n_1 > n_2 > n_3$. A firm’s profit π depends on its efficiency level n . The relative profit difference (RPD) estimates the following equation:

$$RPD = \frac{\pi(n_1) - \pi(n_3)}{\pi(n_2) - \pi(n_3)} \quad (1)$$

Boone’s measurement is based on the intuition that highly competitive markets ‘punish’ inefficient firms to a higher extend than less competitive markets. Basically, an increase in competition reallocates output from less to more efficient firms, increases their variable profit $\pi(n_1)$ and raises the relative profit difference.

However, economists criticize that data on efficiency and variable profits are hardly available. Boone replies that many countries’ statistical offices provide firm-level data on total revenues and wage costs, which allows the calculation of variable profits. To determine efficiency, Boone recommends using average variable costs divided by the output index or worker’s labor productivity as an approximation.

Boone (2008) views the relative profit difference as a legitimate alternative to measure competition. However, he admits that price-cost margins are a valuable competition measure, if an industry does not experience an (uncommon) positive relationship between price-cost margins and competition level. So far, the relative profit difference method could not establish itself in economic mainstream.

Other methods still used by competition authorities are more descriptive and less theory based. The Hirschmann-Herfindahl Index (HHI) or the four-firm concentration ratio are measures of market structure and do not provide any information about firms' behavior. The HHI, for example, is a statistical market concentration measure and equals the sum of square percentage market shares of all firms.² A high HHI implies a strong market concentration, i.e. a small number of firms with large market shares, from which it is tempting to conclude that competition is weak (Rhoades, 1993). This conclusion is premature, however. The HHI does not provide any information on firm conduct and thus may lead to a biased assessment of the intensity of competition. Markets with two competitors only (and, therefore, a high HHI) can be highly competitive, if firms participate in an intense price battle, for example. On the other hand, markets with five firms can be non-competitive, if firms decide to collude and fix prices. The advantage of the HHI in competition issues is its simplicity and the good availability of the required data. Hence, the HHI is still a popular measure in the analysis of mergers' competitive effects, for example applied by the U.S. Department of Justice (U.S. Department of Justice, 2014).

2.2. Review of existing empirical studies

This section provides an overview of the existing studies and highlights the versatility of this approach for studying entry and competition in many different markets.

Certorelli (2002) examines competitiveness in the U.S. banking sector. The author also evaluates the current guidelines for mergers in the U.S. banking market. According to these guidelines a HHI above 1,800 has the potential for anti-competitive behavior and requires regulation by the antitrust authorities. Certorelli's results suggest that duopolists in the banking sector are already highly competitive. However, he still observes an increase in competition, when a third, fourth and fifth firm enters the market. Especially the entry of a fourth bank implies a substantial increase in competition. Markets with five or more banks do not experience large differences in terms of competition; hence mergers in these large markets do not require regulation actions. According to Certorelli, this fact justifies a HHI

²Short numerical example to demonstrate the HHI's composition: Assume we observe a market of five banks with equal shares (20%). The HHI is the sum of all squared market shares of all market participants. Hence we obtain a $HHI=2,000= 20^2 + 20^2 + 20^2 + 20^2 + 20^2$

antitrust regulation threshold of 1,800 because markets with $N > 4$ are usually characterized by a HHI below 1,800.

Labaj et al. (2011) are the first to apply the Bresnahan-Reiss framework in a transition economy. They analyze different retail markets like doctors, electricians or restaurants in Slovakia. Their major interest is the transition process of formerly planned economies into market economies. Therefore, they distinguish between rich south-west Slovakia with a close proximity to the EU markets and the poor north-eastern part. Their entry threshold estimations show substantial differences between the two regions. Entry threshold ratios in the poor east are larger and decline more quickly with an increase in the number of firms than in the western part of Slovakia. Labaj et al. attribute this difference to the weak infrastructure and the small number of highly educated individuals in the eastern part. A better infrastructure in the western part of Slovakia facilitates entry and the threat of possible entry disciplines the incumbents (see Baumol, 1982). Furthermore, a poor infrastructure implies a stronger spatial separation of markets; hence the eastern part of Slovakia is closer to the assumptions made by Bresnahan and Reiss.

Manuszak (2002) examines competition among breweries in U.S. frontier towns in the 1880ies. Manuszak chooses this time period because transport infrastructure was very poor at the time, which implies that individual regional markets were very isolated. Breweries were serving their local market only, which corresponds nicely to the assumptions used in Bresnahan and Reiss. Furthermore, the era around 1880 is of interest because it represents a time period before the prohibition of alcohol in the U.S. Manuszak gathered data on the number of American breweries (Bull et al., 1984) by examining every entry and exit in the brewery market from the colonial time till 1984. Data about the towns' population as well as the number of immigrants from Germany or Ireland were obtained from the 1880 census. In line with most of the other literature, Manuszak's results also indicate that entry of a second and third firm increase competition most severely and he concludes that duopolies in the 1880ies brewery market were not characterized by perfect competition. Moreover, the author finds no evidence for collusive behavior among breweries. A large share of male immigrants from Germany increases demand for beer and thus has a positive impact on the number of firms.

Abraham et al.'s (2005) work investigates the effect of consolidation in the U.S. hospital market from 1994-2000, when the number of firms in many markets reduced substantially.

According to their main hypothesis, local markets with one or two hospitals would imply decreasing competition and, therefore, lower quality. Abraham et al. observe that entry of a second and third hospital substantially increases competition. Entry of additional hospitals, however, does not imply a further significant increase in competition. Therefore, they conclude that antitrust authorities should closely monitor mergers to monopoly or duopoly markets, especially in rural and isolated areas, to guarantee competition, adequate product quality and consumer welfare.

3. Theory

3.1. The Model

This chapter presents the model, which provides the theoretical background for the empirical analysis. This discussion closely follows Bresnahan and Reiss' original analysis published in 1991 in the 'Journal of Political Economy', but also includes extension and simplifications by Schaumans and Verboven (2011), as well as a few of my own remarks.

Demand

Bresnahan and Reiss (1991) assume a classic demand function for a specific product:

$$Q = d(p, \mathbf{Z})S(\mathbf{Y}) \quad (2)$$

Aggregate market demand is the product of a single representative consumer's demand (d) and the number of consumers (S). \mathbf{Z} denotes a vector of market characteristics that influence demand. Bresnahan and Reiss (1990) point out that \mathbf{Z} does not include S . In other words, the market size does not influence consumer's taste or preferences. Consumption network-effects are, therefore, impossible. \mathbf{Y} is a vector of demographic characteristics. S as a function of \mathbf{Y} suggests that changes in demographic variables influence the market size: an increase in total population size, for example, will lead to an increase in the size of the market. Note that demand is decreasing in prices meaning that higher prices decrease consumer demand. Furthermore, total demand increases with the size of the market (S).

The demand of a single firm is:

$$q_N = \frac{Q(S,p)}{N} \quad (3)$$

In this case, Q denotes total market demand and N is the number of firms. The demand per firm decreases with an additional firm entering the market (q is decreasing in N). Further, lower market demand Q reduces the demand per firm.

In the empirical part of the present analysis, I will specifically focus on the market size and the number of firms. The ratio of these two variables will provide important information on the degree of competition in individual markets.

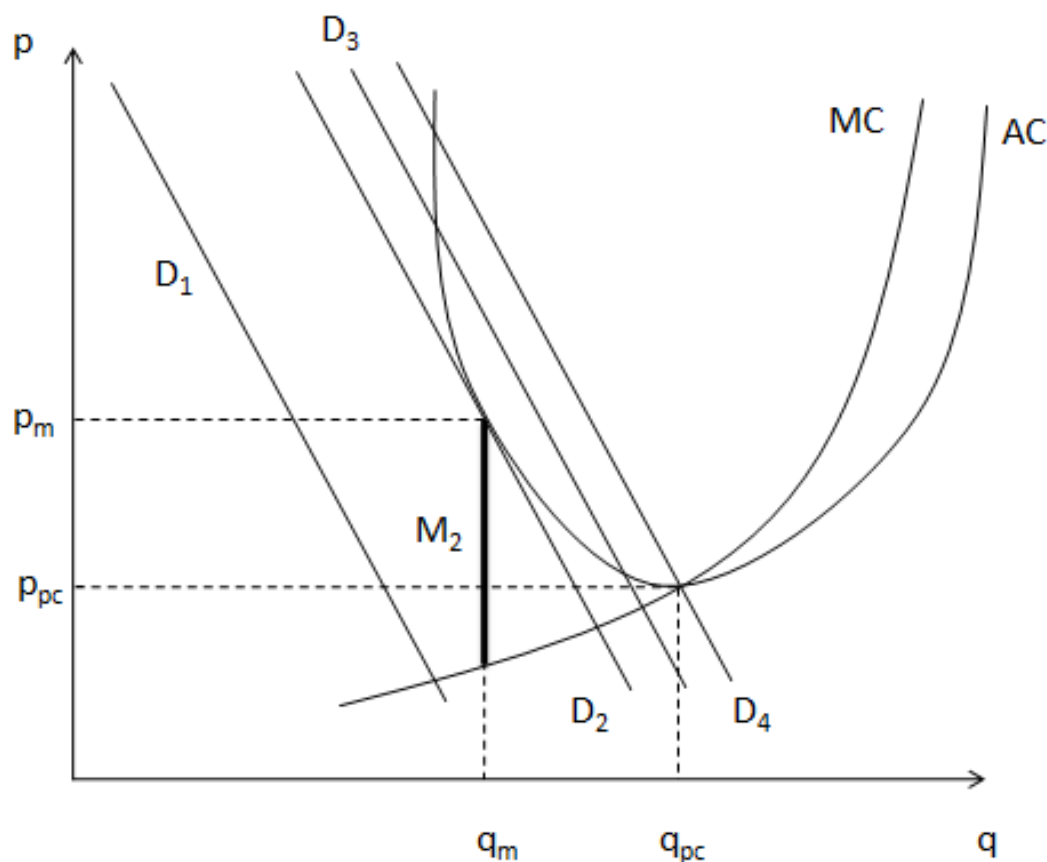
Entry conditions

To simplify the analysis, we assume a homogenous goods market and multiple potential entrants facing an identical cost structure. The implications of different cost structures and diversified goods will be discussed in greater detail in one of the following sections of this chapter.

$$C_i(q_i, \mathbf{W}) = c_i(\mathbf{W})q_i + F(\mathbf{W}) \quad (4)$$

Total costs are composed of fixed costs F and variable costs c and depend on the quantity q produced by a single firm. The vector \mathbf{W} represents exogenous variables that influence costs, such as input prices. Fixed costs $F > 0$ and increasing marginal costs imply a U-shaped average cost curve as shown in *Figure 1*.

Figure 1: Demand and costs



Source: Bresnahan, Reiss (1991)

The downward sloping lines D_1 , D_2 , D_3 and D_4 in *Figure 1* represent different per firm demand schedules. From equation (2) we know that high demand is a consequence of a large number of consumers (S), so these demand schedules basically represent different market sizes.

D_1 represents a situation where per firm demand is too low to support a single firm in the market. Firms facing this demand schedule would not break even, since average costs exceed market prices at all levels of q . This results in a situation where no firm will enter the market. D_2 represents the lowest possible demand for a single firm to break even. In this case, the market would only be served by one firm. The monopolist would sell q_m at a price of p_m . Although the monopolist just breaks even at this point, the price-cost margin is $M_2 > 0$.

As market size increases, demand shifts from D_2 to D_3 . The monopolist's profit increases as well as the theoretical post-entry profits of possible new entrants. Hence demand growth encourages new firms to enter the market and compete for customers against the incumbent. With the entry of new firms, prices and the incumbent's price-cost margin will decrease substantially. However, firms still earn price-cost margins in D_3 , whereas D_4 disallows any margins as this demand schedule intersects with the bottom of the average and marginal cost curve.

Margins ($M_N = p_N - MC(q_N, \mathbf{W})$) allow us to draw conclusions about competition as we can measure the rate at which they decrease as N increases. Positive margins are a sign of incomplete competition and market power of oligopolists (D_3) or monopolists (D_2), while margins will be zero in markets characterized by perfect competition (D_4). Unfortunately, researchers usually only observe market prices, while information about marginal and total costs and, therefore, the size of margins is normally unobservable. The framework suggested by Bresnahan and Reiss (1991), which computes entry thresholds based on the number of consumers, is an attempt to gain information about the size of price-cost margins even without detailed information of firms' production costs.

Firm's profits and entry thresholds

A firm will enter a market, if it expects non-negative long run profits. Therefore, variable profits (V) have to exceed fixed costs.

$$\pi_1 = (p_1 - AC(q_1, \mathbf{W}))q_1(p, N)S_1 - F = 0 \quad (5)$$

$$\pi_1 = V_1S_1 - F = 0 \quad (6)$$

In a monopoly, the firm will be able to set the profit maximizing price. For $p_1 > AC$, the firm's profit increases with S . From equation (5), we compute the size of the market (S_1) demanded for a single firm to break even, which is also called the entry threshold for the first entrant. For market size S_1 , the firm is a monopolist because any other potential

entrant would realize negative profits $\pi_2 < 0$ at S_1 ³. Larger fixed or variable costs increase the market size needed to support a single entrant.

$$S_1 = \frac{F}{(p_1 - AC(q_1, W))q_1(p_1)} \quad (7)$$

A second firm will enter the market, if market size increases sufficiently enough to cover the costs, taking the increased amount of price competition it expects from the incumbent into account. In markets with $N > 1$, the total number of consumers is not only served by one firm, instead it is divided between several competitors. The formation of prices is based on the principles of Bertrand competition; hence no firm sets its price above the price of a competitor. An increased number of firms and consequently increased competition decreases the price.

Generally speaking, a firm's entry decision in a larger market ($N > 1$) depends on the expected profits the firm will earn, given the entry decisions of other potential firms. In other words, in markets with N firms, N firms will expect non-negative profits and any additional potential entrants would expect negative returns.

$$\pi_N = (p_N - AC(q_N, W))q_N(p_N N) \frac{S_N}{N} - F = 0 \quad (8)$$

Setting firms' profits π equal to zero, we obtain the number of consumers a firm requires to break even in a market with $N > 1$, also called the per firm entry threshold s_N .

$$s_N = S_N / N = \frac{F}{(p_N - AC(q_N, W))q_N} \quad (9)$$

The per firm entry threshold equals the ratio between fixed costs and variable profits that guarantees non-negative profits for a given number of firms. Higher fixed costs require a larger number of potential consumers for the same number of competitors to break even. An increase in variable profits, caused by lower variable costs or higher prices, implies a smaller threshold.

Entry thresholds do not provide any information about the intensity of competition yet. They are not comparable between industries or geographic areas due to the different

³ The subscript denotes the number of firms in the market, for example π_2 represents the per firm profit in a market consisting of two firms.

demand and market characteristics. To obtain a valid measurement, Bresnahan and Reiss (1991) compute the ratio of the entry threshold supporting $N+1$ firms relative to the threshold supporting N firms.

$$\frac{s_{N+1}}{s_N} = \frac{(p_N - AC(q_N, W))q_N}{(p_{N+1} - AC(q_{N+1}, W))q_{N+1}} \quad (10)$$

Example (1)

The following numerical example helps understanding and interpreting the threshold ratios proposed by Bresnahan and Reiss (1991). Suppose we observe that it takes at least 5,000 potential customers to support a monopolist in a specific market. The monopoly entry threshold would thus be $s_1 = 5,000$. Now assume that 20,000 potential customers are required to support the entrance of a second firm in this market. The per firm entry threshold for this duopoly market would then equal $s_2 = 10,000$. The threshold ratio s_2/s_1 thus equals two.

Based on the assumptions made, the ratio measures the rate at which margins fall due to new entrants. If entry of new firms does not have any effect on competition, the price would remain constant ($p_N = p_{N-1}$) and price-cost margins would be constant. This implies a threshold ratio equal to one.

Notice that entry threshold ratios are a relative measure of competition, not an absolute one. In contrast to the Herfindahl- Hirschmann- Index there are no classifications or ‘rules of thumb’ which allow us to give an absolute statement about the intensity of competition. An entry threshold ratio only provides information about the change in competition due to the entry of a new firm. An entry threshold ratio equal to one does not answer the question of whether or not competition is intense; this ratio only tells us that the entry of an additional firm has no impact on the intensity of competition. Note that an entry threshold ratio of one, for example, is consistent with perfect competition but also with a perfect cartel.

Cartel

Assume that a second firm enters the market and establishes an arrangement with the former monopolist to keep the price for a good at the monopoly level. Consequently, the entrant requires $s_2 = s_1$ number of consumers to break even as well. When firms preserve the cartel as N increases, every additional firm requires a constant number of additional consumers. This leads to equal thresholds $s_1 = s_2 = s_3 = s_4$ and so on.

Perfect competition

Standard oligopoly theory defines perfect competition as a state where competition between numerous firms is intense enough to reduce prices to the firm's marginal cost level. This implies price-cost margins equal to zero. Assuming a market with perfect competition, the N -th entrant will sell his good at $P = MC$ because he cannot further decrease the price without making losses. Therefore, this entrant requires the same number of additional consumers to break even (s_N) as the $N-1$ -th firm, so we obtain a threshold ratio

$$\frac{s_N}{s_{N-1}} = 1.$$

Example (2)

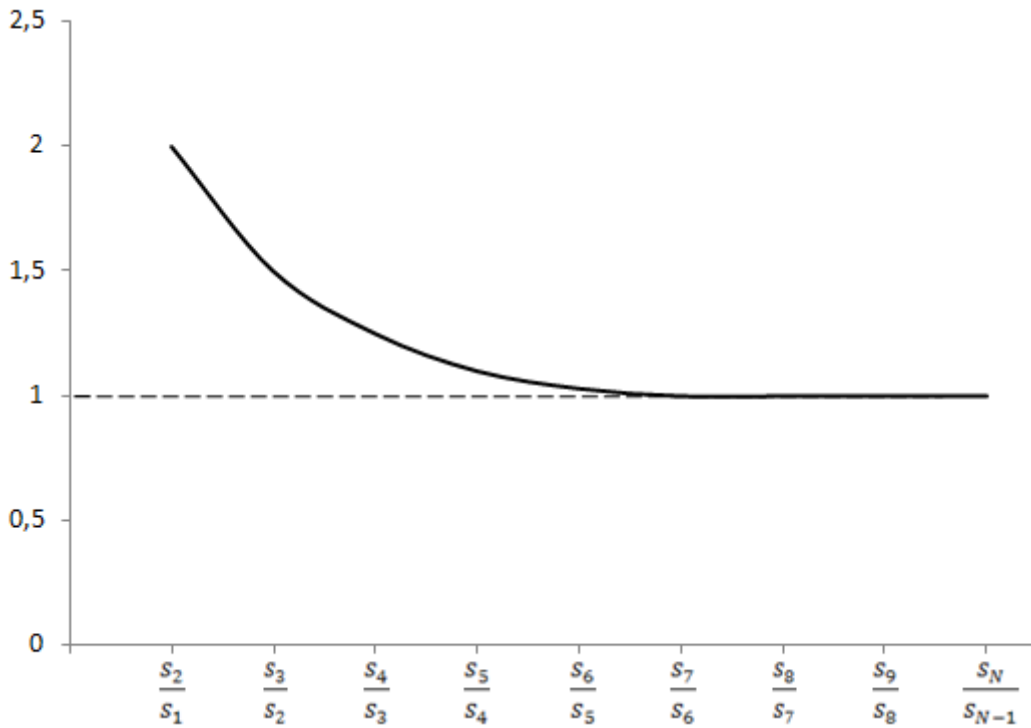
Continuing the previous example, we now consider a market with six firms and a total number of $S_6 = 120,000$ potential customers, which implies $s_6 = 20,000$. If we expect a seventh firm to enter a perfectly competitive market, the threshold S_7 would be equal to 140,000 ($s_7 = 20,000$ again). This implies a threshold ratio $S_7/S_6 = 1$. Additional entrants will not lead to an increase in competition and thus a further decline in prices, hence $s_6 = s_7 = s_\infty = 20,000$. Comparing the per firm entry threshold for a monopolist with the per firm entry threshold in a perfectly competitive market, we obtain a threshold ratio $S_\infty/s_1 = \frac{20,000}{5,000} = 4$.

Naturally, we would expect per firm entry thresholds in oligopolistic markets⁴ to range between 5,000 and 20,000 potential customers per firm. *Figure 2* depicts the development of threshold

⁴ Oligopolistic markets are characterized by a degree of post-entry competition between monopoly and perfect competition.

ratios in this numerical example and also indicates declining entry threshold ratios in N .⁵ Schaumans and Verboven (2011) state that this development is intuitive because entry may have stronger effects on competition if one starts off from few firms with strong market power. Additionally, it follows from (10) that convex variable profits lead to declining entry threshold ratios.

Figure 2: Threshold ratios



Different cost functions

Until now we assumed that all firms are identical and face the same cost function. Later entrants, however, might be confronted with higher fixed or variable costs than early entrants. These higher costs might result from the usage of less efficient technologies, entry barriers or higher expenses on advertising.⁶ Bresnahan and Reiss (1991) account for these extra costs by including the constants $b_N \geq 0$ and $B_N \geq 0$ in the profit function.

$$\pi_N = (p_N - AC(q_N, \mathbf{W}) - b_N)q_N(p, N) \frac{s_N}{N} - F - B_N = 0 \quad (11)$$

⁵ Bresnahan and Reiss (1991) use a very likewise similar example and also conclude that entry threshold ratios are declining in N .

⁶ If consumers are loyal to incumbents, entrants often have to spend higher amounts on advertising to attract these consumers.

Rearranging (11), we obtain the per firm entry threshold:

$$s_N = S_N/N = \frac{F+B_N}{(p_N-AC(q_N, W)-b_N)q_N} \quad (12)$$

Assuming a positive relationship between the extra costs and the number of firms ($\frac{\partial B_N}{\partial N} > 0$; $\frac{\partial b_N}{\partial N} > 0$), we find an increase in s_N relative to s_1 .

Product differentiation

Schaumans and Verboven (2011) analyze the impact of product differentiation on the entry threshold ratios. They conclude that product differentiation can even lead to threshold ratios smaller than one. Schaumans and Verboven (2011) argue that a new entrant could lead to a substantial market expansion effect due to consumers' preference for variety. If this market expansion effect dominates the effect of intensified competition, it is possible that the number of firms increases more than proportionally with market size. Empirical studies provide several examples where product differentiation might have caused threshold ratios smaller than one.⁷

Product differentiation, therefore, can have a strong impact on threshold ratio estimates. Hence, researchers typically aim at applying the Bresnahan and Reiss (1991) framework in homogenous goods markets.

Regulation

Bresnahan and Reiss (1991) ignore the influence of governmental institutions on the degree of competition. However, laws and regulations play an important role in markets and their effect on the measurement of entry threshold ratios should be examined. The government can regulate markets and firms in two different ways. First of all, it can regulate location and the number of firms in regional markets and second it can regulate prices.

⁷ Schaumans and Verboven's estimate of entry threshold ratios for restaurants (0.87) and Labaj et al.'s ratio for doctors (0.79) are two examples where product differentiation might have caused the threshold ratios to be smaller than one. Product differentiation in the case of restaurants, for example, means that the second restaurant could offer Asian food instead of local cuisine. Total demand in the restaurant market would increase by the number of consumers with a preference for Asian food. Product differentiation in the market of doctors could be due to specialization by an additional doctor in the local market (for example in internal medicine or dermatology when the first doctor keeps on working as a general practitioner).

Discussing the impact of entry regulation (number and location of firms) in a general way is quite difficult because there are many possible regulation combinations: regulating the entry of firms without regulating the location of firms, for example, may have very different effects as regulating both dimensions. I will discuss the consequences of entry regulations for the particular case of notaries in a following chapter. Notice that most forms of entry regulation will influence competition and, therefore, affect the threshold ratios.

Price regulation can occur in two different ways. A government can either set price boundaries, i.e. a minimum and/or maximum price, or completely fix the price at a certain level. Price minima and maxima should not influence competition seriously, except the government contravenes against its own goal of maximizing social welfare. If a government sets the price minimum above marginal costs, the per firm entry thresholds will increase with the number of firms until the price reaches this minimum. After this point, every firm will offer its good at the minimum price and the threshold ratios will be equal to one. The difference to an unregulated market would be that we arrive at an entry threshold ratio of one for a smaller number of firms. In an unregulated market, the additional entry of firms would drive prices down even further, which implies entry threshold ratios above one.

Maximum prices, if not set below marginal costs, will reduce threshold ratios for markets with a small number of competitors. An upper bound for prices will primarily reduce prices in a monopoly or duopoly market. The per firm entry threshold for monopolists and duopolists will increase, while thresholds in markets with a higher number of firms will remain constant. Therefore, the curvature of the ratio curve depicted in *Figure 2* will become flatter. Notice that this argument is based on the assumption that firms do not form perfect cartels.

If the regulator sets a specific price in a market, applying the Bresnahan-Reiss framework would give constant threshold ratios equal to one (provided that every firm has the same characteristics and costs). Summing up, applying this model in markets where firms compete over prices, face the same cost structure, sell a homogenous good and are little regulated, should give the clearest results.

3.2. Estimation of the thresholds

This chapter illustrates the estimation of entry thresholds. The basic specification of an empirical model for estimating entry thresholds is provided by Bresnahan and Reiss (1991). The present description is based upon a modified version used in Schaumans and Verboven (2011). We start with a firm's profit function (6).

$$\pi_N = V_N S - F \quad (6)$$

V_N represents the per capita variable profits and is declining in the number of firms (N), hence $\frac{dV}{dN} < 0$. Note that data on variable profits and fixed costs typically are not available; however we can indirectly learn something about firms' profits and fixed costs from observing that N firms compete (and realize positive profits) in a specific environment, but $N + 1$ firms do not.

$$V_{N+1}S - F < 0 < V_N S - F \quad (13)$$

or equivalently in logarithmic form

$$\ln \frac{V_{N+1}}{F} + \ln S < 0 < \ln \frac{V_N}{F} + \ln S \quad (14)$$

Following Schaumans and Verboven (2011) and Nahuys and Noailly (2010) we assume that the logarithmic ratio of variable profits over fixed costs is determined by a vector \mathbf{X} of observable market characteristics (e.g. the share of foreigners or the unemployment rate), fixed effects θ of N firms and an unobserved error term ε .

$$\ln \frac{V_N}{F} = \beta \mathbf{X} - \theta_N + \varepsilon \quad (15)$$

The firms' fixed effects are the cut points that can be estimated with an Ordered Probit model. Variable profits decrease in the number of firms while fixed costs remain constant, hence the fixed effects θ are supposed to increase in N . This implies that $\theta_N < \theta_{N+1} < \theta_{N+2}$ and so forth.

Integrating (15) in (14), we obtain:

$$\beta \mathbf{X} - \theta_{N+1} + \ln S < \varepsilon < \beta \mathbf{X} - \theta_N + \ln S \quad (16)$$

Rewriting the entry condition, we observe the probability that firm N 's profits are positive:

$$P(\pi_N \geq 0) = \alpha \ln S_N + \beta \mathbf{X} - \theta_N - \varepsilon \quad (17)$$

If we now apply the Ordered Probit model, the model will provide parameter estimates for α and β as well as the cut point values θ . Note that the error term ε has a normal distribution and zero mean.

By setting the break even profits equal to zero in equation (17) and solving for S , we calculate the exact market size where an N -th firm breaks even.

$$S_N = \exp\left(\frac{\theta_N - \beta \bar{X}}{\alpha}\right) \quad (18)$$

In this equation, all market characteristics are evaluated at their sample mean \bar{X} . The per firm threshold s_N is estimated by the ratio of total market size S_N required to break even divided by the number of firms N .

$$s_N = S_N / N \quad (19)$$

Entry threshold ratios are obtained by the ratio s_{N+1} / s_N .

3.3. Econometric models

This chapter will discuss the econometric models applied in this thesis: the Ordered Probit and the Tobit model. The following chapter is based upon the more detailed description of these methods in Tobin (1958), Wooldridge (2006)⁸, Kennedy (1998)⁹ as well as the lecture notes of Professor Foster of the University of Vienna.

Ordered Probit Model

Bresnahan and Reiss (1991) have shown that entry thresholds and entry threshold ratios can be estimated with an Ordered Probit model. The Ordered Probit model is closely related to the standard Probit model. The Probit model is a binary response model, where the dependent variable y can only take on two values, either zero or one. The Probit model estimates the probability of a positive response ($P(y = 1 | X)$) by introducing an unobservable latent variable y^* .¹⁰

$$y^* = X\beta + \varepsilon \quad (20)$$

$$y = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases}$$

⁸ provides information about the Tobit model

⁹ provides information about the Ordered Probit model

¹⁰ Common economic examples for binary response models are the participation in the labor market (1=in the workforce; 0=unemployed) or the acceptance of loan applications.

Note that the error term ε is independent of y and has a standard normal distribution. Consequently, we can estimate the response probability with the latent variable as follows:

$$P(y = 1|X) = P(y^* > 0|X) = P(X\beta + \varepsilon > 0 | X) = P(\varepsilon > -X\beta | X) = 1 - G(-(X\beta)) = G(X\beta) \quad (21)$$

Since the function G is non-linear, it is difficult to estimate the exact effect of X on y (i.e. the betas). Available scale factors allow us to compare the results with a linear probability model.

However, a binary choice model is not sufficient to account for more than two possible responses. In the present context, the dependent variable can take different values (from zero to six or more firms) and hence we need to apply an Ordered Probit model.

An Ordered Probit model provides the probabilities for different outcomes or values.¹¹ For each outcome (or cut point), the underlying latent variable has an upper and a lower bound Z_i .

$$y^* = X\beta + \varepsilon \quad (20)$$

$$y = \begin{cases} 0 & \text{if } y^* \leq 0 \\ 1 & \text{if } 0 < y^* \leq Z_1 \\ 2 & \text{if } Z_1 < y^* \leq Z_2 \\ \vdots & \\ N & \text{if } Z_{N-1} < y^* \end{cases}$$

In the empirical application, the cut points are the different numbers of firms, while the boundaries represent the thresholds. We will compute the estimated response probabilities for every cut point and derive the thresholds from these response probabilities and the betas.

$$P(y = 0|X) = P(y^* < Z_1|X) = P(X\beta + \varepsilon < Z_1|X) = P(\varepsilon < Z_1 - X\beta|X) = 1 - G(X\beta - Z_1) \text{ (for the first threshold)} \quad (22)$$

$$P(y = N|X) = P(y^* > Z_{N-1}|X) = P(X\beta + \varepsilon > Z_{N-1}|X) = P(\varepsilon > Z_{N-1} - X\beta|X) = G(X\beta - Z_{N-1}) \text{ (for the last threshold)} \quad (23)$$

¹¹ Ordered Probit models are often applied in questionnaires with different answer options (e.g. personal opinion on the health care system- excellent, good, fair, poor).

$$\begin{aligned}
P(y = k|X) &= P(Z_{k-1} < y^* \leq Z_k|X) = P(X\beta + \varepsilon \leq Z_k|X) - P(X\beta + \varepsilon < Z_{k-1}|X) = \\
&P(\varepsilon \leq Z_k - X\beta|X) - P(\varepsilon < Z_{k-1} - X\beta|X) = 1 - G(X\beta - Z_k) - 1 + G(X\beta - Z_{k-1}) = \\
&G(X\beta - Z_{k-1}) - G(X\beta - Z_k) \text{ (for any inside threshold)}
\end{aligned} \tag{24}$$

The Ordered Probit model, however, also has some disadvantages. In particular, it is associated with some information loss. First, the estimation procedure requires pooling of markets with six or more firms into one category. And second, the number of firms in the different markets is not only an ordinal measurement but also a count (cardinal measure): two firms are not only more than one, it is exactly one more.

The following section thus describes an alternative empirical model which uses this information.

Linear Regression and Tobit model

The theoretical analysis discussed in Chapter 3.1. suggests a positive concave relationship between population and number of firms. A simple empirical approach to investigate this relationship would apply a linear regression model to test the impact of control variables (*unemployment rate, young adults, foreign, commuter ratio*) and explanatory variables (*population and population squared*) on the number of firms in different regional markets:

$$\text{Number of firms} = \beta_0 + \beta_1 \text{Population} + \beta_2 \text{population squared} + \beta X + \varepsilon$$

$$\text{Assumptions to test: } \beta_1 > 0; \beta_2 < 0$$

The coefficient of the '*population*' variable is supposed to be positive, while the coefficient of the '*population squared*' variable should be negative. Estimating this relationship with Ordinary Least Squares (OLS) method would provide inconsistent results, since the data are censored: the number of firms in a market is non-negative and the majority of observations (municipalities) exhibit a dependent variable (number of firms) equal to zero. The large share of observations without a single firm would cause a downward biased estimate of the coefficients and an upward-biased intercept estimate in an OLS regression.

Since the number of firms is a count response, applying a Poisson regression model would be a possible option. However, Wooldridge (2006) recommends using a Tobit rather than a Poisson model for corner solution outcomes. Moreover, the majority of the other

researchers in this field also apply a Tobit model; hence the first part of the empirical results will consist of Tobit model estimations.

James Tobin (1958) introduced the Tobit model to investigate the impact of households' income on the expenditures on cars per year. He observed a large amount of households without any expenditure, since they already bought a car in a previous year. Tobin (1958) refused to exclude these households from the dataset because, due to the fact that they possessed a car, they were not irrelevant. Nevertheless, households without expenditures would still bias his results.

To avoid this bias, he introduced an underlying latent variable Y^* (households' expenditures) with a lower bound z .

$$Y_i = \begin{cases} Y_i^* & \text{if } Y_i^* > z \\ 0 & \text{if } Y_i^* \leq z \end{cases} \quad (25)$$

If the latent variable Y^* is larger than the defined limit z , the dependent variable Y adopts the latent variable's distribution. Note that the limit z is equal to zero in the previous example of households' expenditures on cars. However, the limit z is variable and can be an upper bound as well.

If we simply seek to estimate the probability whether the dependent variable is above or below the limit z , we can exercise a standard Probit model. In contrast to the Probit model, the Tobit model also explains the properties of the non-limit responses. Tobin described his model as a 'hybrid of Probit analysis and multiple regression'. Similar to the Probit model, we cannot interpret the estimated coefficients just as OLS coefficients. The Tobit coefficients depict the regressors' effect on the latent variable Y^* .

The Tobit model is very suitable to analyze the relationship between the number of firms and population in the notary and driving school market. Both markets are characterized by a large share of municipalities without any notary or driving school. Based on observations with one or more firms, we will estimate the independent variables' effects on the number of firms. It should be mentioned, however, that the main drawback of the Tobit-model in comparison to the Ordered Probit analysis is the assumption that the same functional form

is assumed to describe the relation between the number of firms and market size over the entire span on observations.

4. Market Characteristics

4.1. The Data

Two different Austrian markets- notaries and driving schools- are analyzed in this thesis. The dependent variable in the empirical analysis is the number of firms (notaries/driving schools) in a spatially separated market. We follow Schaumans and Verboven (2011) and Asplund and Sandin (1999a) and define municipalities as separate markets. Note that this is a strong assumption, since consumers are capable of purchasing goods and services in other markets; hence market separation is not entirely possible. Bresnahan and Reiss (1991) solve this problem by exclusively including municipalities characterized by a minimum distance of 20 miles to the next town. However, Austria's geographical structure (high population density, small distances between municipalities) would not allow a significant sample of Austrian towns which pass this requirement. Moreover, papers like Nahuis and Noailly (2010) and Schaumans and Verboven (2011) also apply the Bresnahan- Reiss framework in countries (Netherlands and Belgium) where market separation is not entirely guaranteed.

The data contains every single municipality in Austria (total number: 2,357) except Vienna. Municipalities are defined by a unique ZIP code. Vienna is excluded because Vienna's population as a whole would be an outlier in the dataset; Austria's capital town is approximately six times larger than the second largest city Graz (Statistik Austria, 2013). Hence, including Vienna could cause a bias in the estimates (see Osborne and Overbay, 2004). One way to deal with this problem would be using Vienna's 23 districts as individual observations. However, this approach would amplify the problem of market delineation described above; given the high population density, the good transport infrastructure and the (relatively) small size of the districts (measured in km^2), the individual districts cannot be regarded as spatially separated markets. Inhabitants of one district certainly consume services provided in other districts, which would alleviate the relationship between population and the number of firms suggested by theory.

Data on notaries was provided by Mrs. Brigitte Szabad in the name of the 'Notariatskammer Österreich' (Austrian Chamber of Notaries). The Chamber of Notaries regulates the entire market -together with the Austrian Ministry of Justice- and affirms the dataset's completeness. The data consists of every notary's name, address and ZIP code. In the dataset, every municipality is matched with the total number of local notaries.

Information on the number of driving schools is obtained from the published member list at the homepage of the 'Berufsgruppe der Fahrschulen (2013)' (Association of Driving Schools), a part of the 'Wirtschaftskammern Österreich' (Austrian Economic Chambers). Every official Austrian driving school is an Association of Driving Schools' member and is represented at their member list. The dataset consists of name, address and ZIP code of every driving school headquarter.

In addition, we collect data on population size, share of foreigners, percentage of young adults, unemployment rate and share of commuters in every Austrian municipality (except Vienna). The definitions of these variables as well as the source of the data are described in *Table 1*. *Table 2* provides descriptive statistics of all variables used.

Table 1: Definitions of the variables and data source

| Variable | Definition |
|-------------------|--|
| Population | Total population in a municipality. Data from 2009 were collected from 'Statistik Austria'. |
| Unemployment rate | Rate of unemployment in a municipality. Data is obtained from 'Statistik Austria', which applies the international definition of unemployment. The international definition of unemployment refers to a person as unemployed, if he or she does not work in the reference week (vacation and illness excluded), does not actively search for work and has no prospect to get a job (Gumprecht et al., 2011). |
| Young adults | Population of age 15-34 divided by total population in a municipality. ¹² Source: 'Statistik Austria'. |
| Foreign | Percentage of individuals without an Austrian citizenship in a municipality. Data were collected from 'Statistik Austria'. |
| Commuter ratio | Number of commuters divided by the total population. Commuters are defined as individuals who work in another municipality than their home town (Statistik Austria, 2004). Data is obtained from 'Statistik Austria' in 2009. |

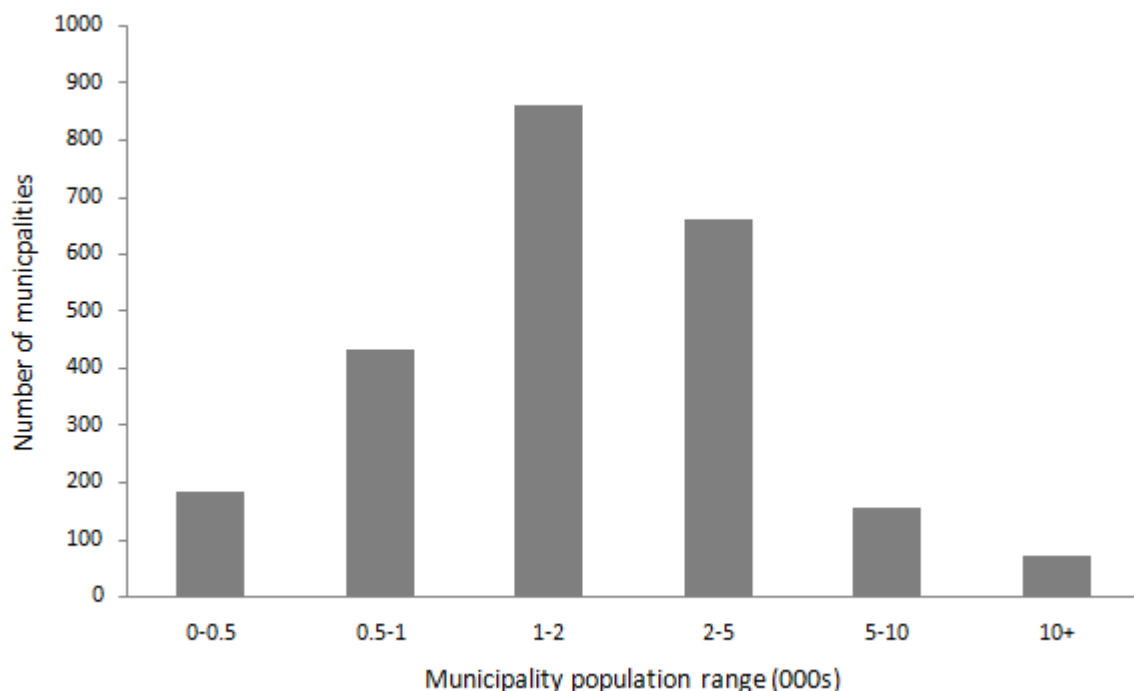
¹² If we take the level of young adults -as Asplund and Sandin (1999a) do-, we would capture the effect of an additional (young) individual on the number of firms. However, this effect is already included in the variable *population*; hence we take the share of young adults as a control variable to incorporate the decomposition according to age of the *population* variable. Furthermore, we would have to distinguish between entry thresholds for young adults and total population- if *young adults* was a total number- which would make the estimation process unnecessarily complicated.

Table 2: Descriptive statistics

| Variable | Mean | Standard Deviation | Min | Max |
|---------------------|--------|--------------------|-------|---------|
| Population | 2837.3 | 8597.93 | 62 | 256,319 |
| Unemployment rate % | 4.8% | 0.03 | 0.5% | 29% |
| Young adults % | 18% | 0.02 | 9% | 29% |
| Foreign % | 5% | 0.04 | 0.09% | 51% |
| Commuter ratio % | 31% | 0.24 | 0.03% | 64% |
| Notaries | 0.16 | 0.59 | 0 | 15 |
| Driving schools | 0.13 | 0.55 | 0 | 13 |

Figure 3 shows the distribution of municipalities with respect to population. The majority of municipalities have a population size between 500 and 5,000 inhabitants; the mean (median) population is 2,800 (1,600). The dataset also includes a large number (182) of very small municipalities (less than 500 inhabitants). Note that the category with the largest municipalities in *Figure 3* is very heterogeneous; this category includes all municipalities with more than 10,000 inhabitants. The largest city Graz has a total population of 256,319 inhabitants.

Figure 3: Distribution of municipalities' population size



402 registered notaries and 324 registered driving schools are offering their services in Austria. The distribution of the number of notaries and driving schools in the Austrian municipalities is highly skewed. 2,186 municipalities do not have a local driving school. Similarly, the inhabitants of 2,118 municipalities do not have access to a local notary. *Figure 4* presents the distribution of notaries and driving schools for municipalities with at least one notary or driving school. The y-axis measures the number of municipalities with a specific number of firms. Following Nahuis and Noailly (2010) and Certorelli (2002), municipalities with more than five local firms are pooled in one category.

Figure 4: Distribution of notaries and driving schools

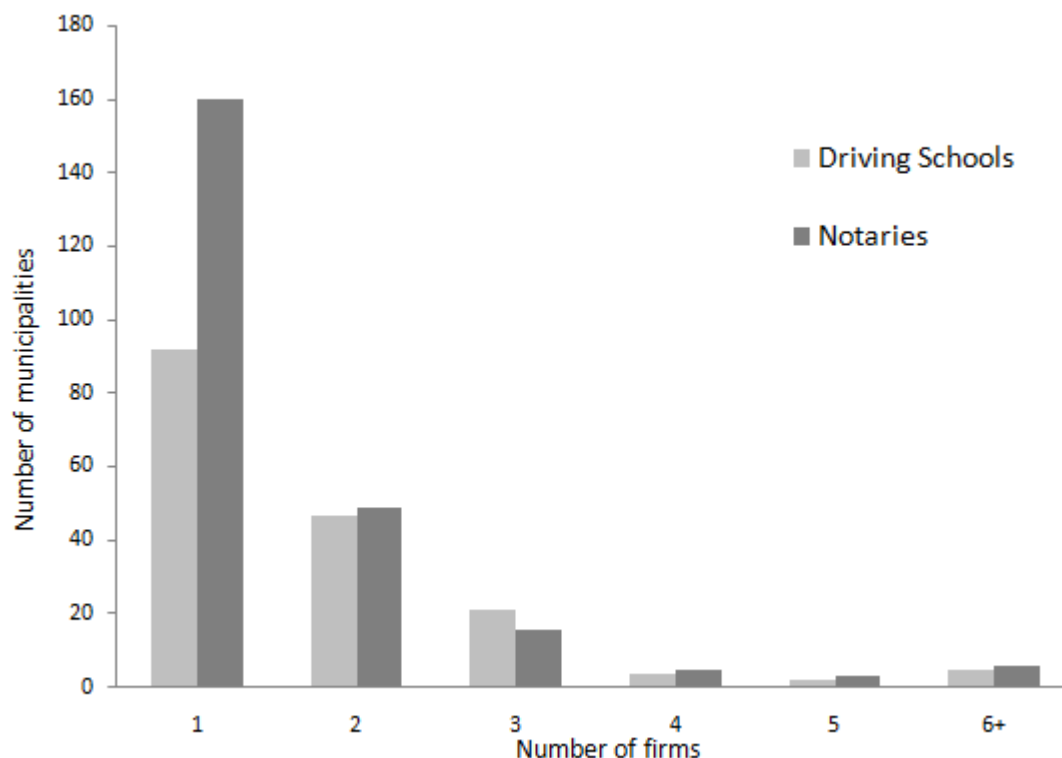


Figure 5 (6) presents for a given population size the distribution of municipalities, which have one, two, three, four, five or six or more notaries (driving schools). Hardly any municipalities with less than 2,000 inhabitants are served by a notary or driving school. Even the majority of municipalities with a population size between 5,000 and 10,000 do not have a single notary or driving school. The figures also give a suggestion where the different entry thresholds are supposed to be located. Figure 5 suggests that the entry threshold for a single notary is located close to 10,000. The monopoly entry threshold for a driving school lies above 10,000 (Figure 6).

Figure 5: Notaries by municipality population

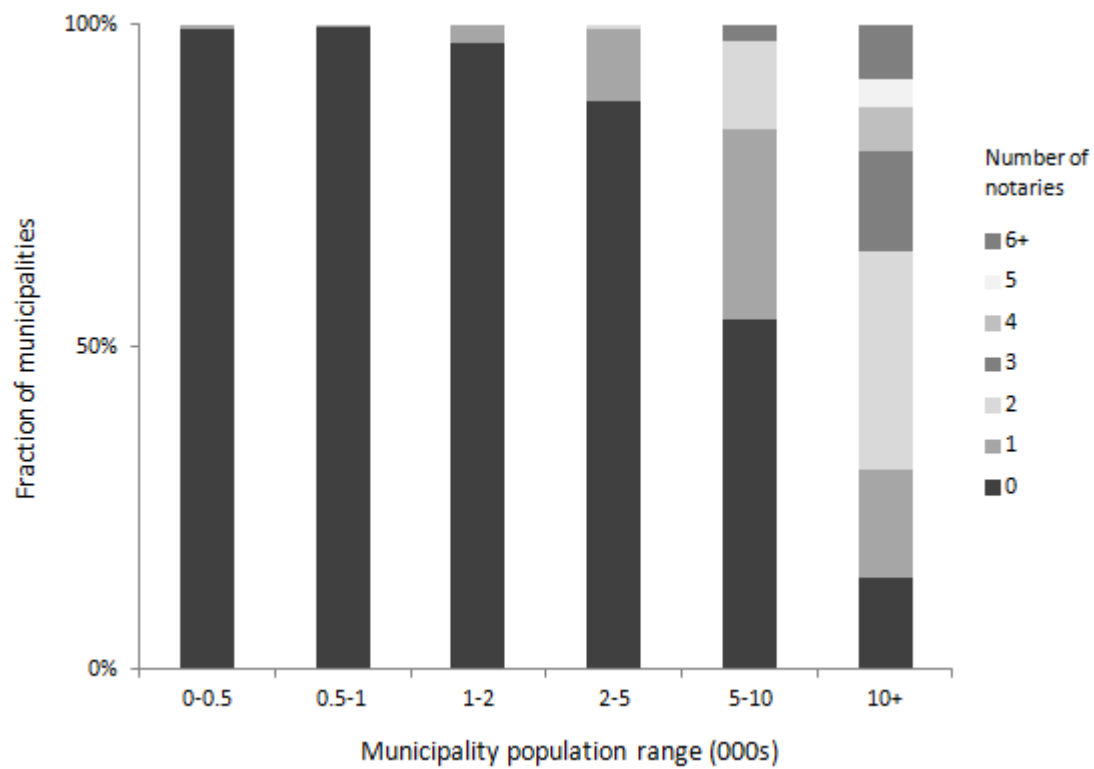
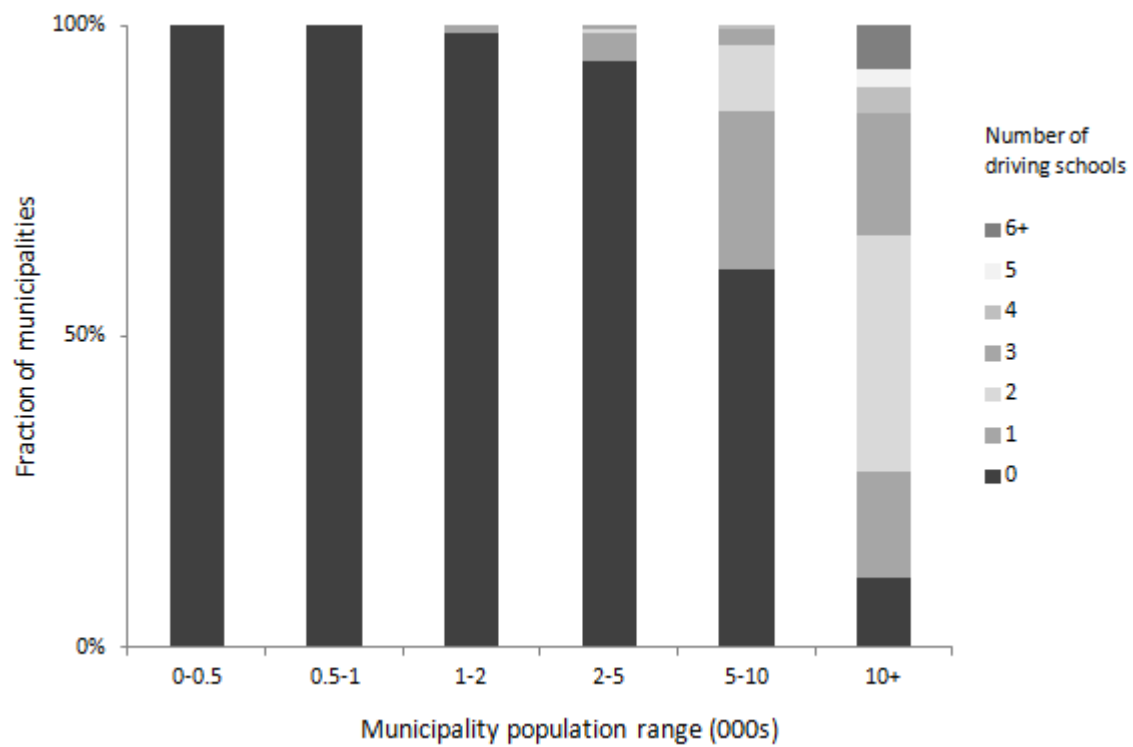


Figure 6: Driving schools by municipality population



4.2. Description of notaries

Austrian notaries are representatives of the Latin German type. A Latin German notary's job description is to "receive, interpret and give legal form to the will of the parts, to write the documents required for that purpose and to guarantee the authenticity of those documents and to keep originals and issue copies of these originals" (Mateus, 2005). This implies that notaries are supposed to be trustworthy, which requires rigorous supervision to guarantee high quality standards. Hence, the Austrian notary market is highly regulated by different authorities.

The ministry of justice is the only authorized institution to establish new notary offices. The department determines the demand for notaries in a municipality based on population size, traffic links to other municipalities and economic indicators (Österreichisches Bundeskanzleramt, 2013). In other words, the notary supply is entirely regulated by the ministry of justice. Qualified individuals cannot simply enter the notary market if they detect a business opportunity in a particular municipality.

Requirements for notaries are highly selective. A future notary has to hold a university degree in Austrian law. Law degrees from foreign universities do not permit to work as an Austrian notary. After finishing their university studies, candidates have to pass the notary examination to become an aspirant. Being an aspirant, however, does not guarantee a future career as a fully independent notary. If an independent notary job is vacant, the ministry of justice assigns the chamber of notaries to nominate an aspirant. The aspirant must prove at least seven years of work experience in the relevant field. Finally, the ministry of justice has to approve the nomination (Notariatskammer, 2013).

Compared to other occupations, becoming a notary is a very long and demanding process. The pool of qualified candidates is limited as the apprenticeship discriminates foreigners.¹³ Competitive market forces are constrained by the fact that government and the chamber of notaries are regulating the process of market entry of new firms. For example, the chamber of notaries can refuse to nominate new aspirants or raise the requirements to protect their

¹³ This point has been criticized frequently by the EU and even led to an Austrian conviction in an EU trial against discrimination (Oswald, 2011). However, laws are very country-specific; hence these restrictions might be justified in practice.

current members' interests. The chamber of notaries' action would decrease competition and increase profit margins for existing notaries.

Furthermore, authorities regulate the price setting process as well. Although there are no minimum prices in the Austrian market, maximum and reference prices do exist (Mateus, 2005). Notaries can undercut a competitor's price; however predetermined reference prices reduce the incentives to engage in price competition but stick to the reference price.

Austria is not the only highly regulated European notary market. Some countries, like Italy or Spain, specify minimum and maximum prices and prohibit advertising of notaries.¹⁴ Great Britain, the Scandinavian countries and Denmark do not have notaries in form of a liberal profession. Examples for de-regulated notary markets are the Netherlands and, albeit to a lesser extent, Portugal (Mateus, 2005). In 1999, the Dutch Notary Act liberalized the notary market and de-regulated prices and market access. Today, Dutch notaries can choose any district to establish a new business (Verstappen, 2007).

Nahuis and Noailly (2010) study the Notary Act's impact on competition by applying the Bresnahan and Reiss (1991) framework. Their results will be discussed in greater detail in Chapter 5. Verstappen (2007) observes that the Notary Act led to numerous personal conflicts between rivaling notaries.¹⁵ Moreover, Verstappen states that the number of notaries did not increase significantly after the de-regulation. According to Van den Bergh and Montangie (2006), the Dutch liberalization caused a decrease in quality and notary's integrity. They highlight that de-regulated notary markets require institutions which control and monitor quality.

4.3. Description of driving schools

Driving schools are a very unique market. In contrast to other markets, the target audience is very narrow, since most customers are between 18 and 25 years old. Furthermore, most individuals use driving school services once or twice in their life because Austrian driving licenses do not expire. Hence, we would expect a strong connection between population and demand.

¹⁴ France and Germany, for example, set minimum and maximum prices but allow advertisement.

¹⁵ Verstappen (2007) refers to the area around Drenthe (NL) as a 'notary's Fallujah (city in Iraq)' due to heavy personal tensions between rivaling notaries.

In contrast to the notary market, driving schools are less regulated and the number of competitors is determined by the driving schools themselves. Entrepreneurs are allowed to establish a new driving school, if they are at least 27 years old and possess an Austrian or EU citizenship. Further, they are required to hold a degree of a technical high school with a focus on engineering or electro technology. If the candidates meet these requirements, the local governor issues the approval and the candidates can open a new driving school (Österreichisches Kraftfahrgesetz, 2014).

At first glance, driving schools seem to operate in a rather unregulated and competitive environment. Hence, theory assumes entry threshold ratios above one with a convergence towards one when the number of firms is increasing. However, different cartelization accusations in Austria in the recent past raise reasonable doubts that the driving school market is as competitive as predicted. The Austrian Competition Authority recently accused driving schools of forming a cartel in two cases. The first case dates back to the year 2005, when five driving schools near Graz were convicted for price-fixing. In the course of the investigation, the driving schools confessed and justified their actions by referring to a ruinous price competition in the market. In addition, seven driving schools located near Innsbruck received a 70,000€ fine for forming a cartel in 2008. The cartel was uncovered, when two driving schools reported the offence and, therefore, obtained key witness status (Österreichische Bundeswettbewerbsbehörde, 2013). These cases suggest that driving schools are not as competitive as the preconditions might indicate.

5. Results

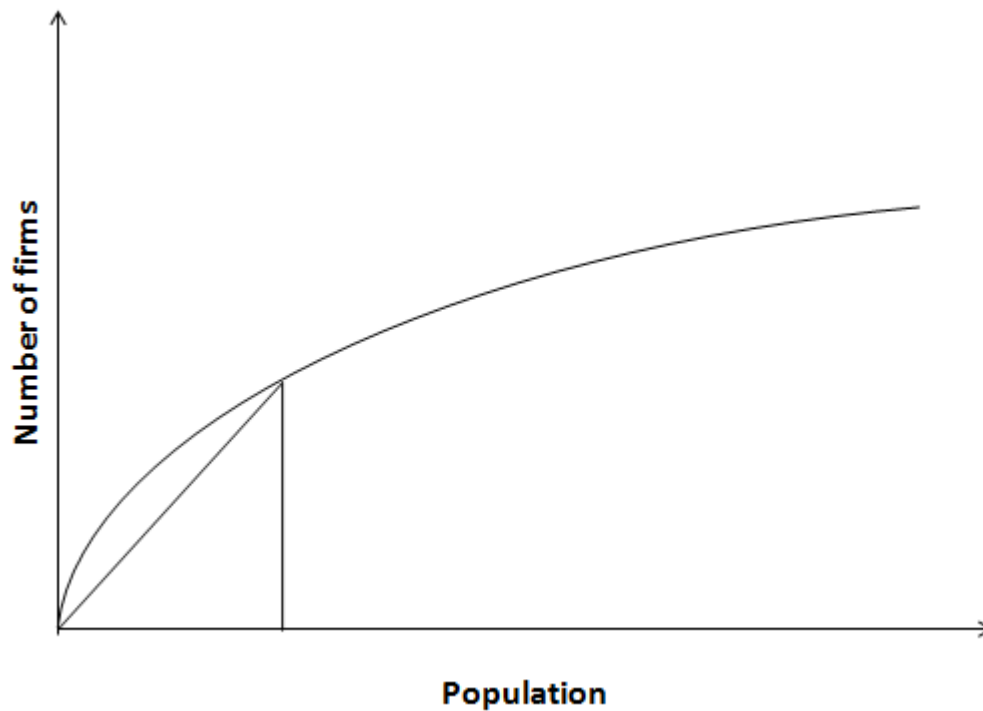
The following section reports estimation results obtained from a Tobit as well as an Ordered Probit model. Entry thresholds for both markets (notaries and driving schools) are presented in the second part of the chapter.

Results from Tobit model

The Tobit model examines the impact of control (*unemployment rate, young adults, foreign, commuter ratio*) and explanatory variables (*population* and *population squared*) on the

number of notaries and driving schools. The theoretical analysis suggests a positive concave relationship between population size (x-axis) and the number of firms (y-axis); i.e. the coefficient of the *population* variable should be positive, while *population squared* should exert a negative impact.

Figure 7: Expected relationship population-number of firms



The results of the econometric model are reported in *Table 3*.

Table 3: Tobit Model

| Tobit Model | Driving Schools | Notaries |
|---|----------------------|----------------------|
| Population (in thousands) | 0.174*** (0.014) | 0.055*** (0.005) |
| Population squared (in thousands) ¹⁶ | -0.622*** (0.067) | -0.002** (0.0007) |
| Unemployment rate | 10.244*** (3.537) | 11.076*** (2.804) |
| Young adults | 2.057 (4.789) | -5.716 (3.938) |
| Foreign | 4.769** (2.266) | 8.874*** (1.800) |
| Commuter ratio | -3.701*** (0.570) | -4.384*** (0.454) |
| Constant | -3.780*** (0.934) | -1.717** (0.741) |
| Number of observations | 2,349 | 2,349 |
| Pseudo R ² | 0.316 | 0.233 |

Remarks: Standard errors are in parenthesis. ***, ** and * indicates that parameter estimates are significantly different from zero at the 1%, 5% and 10% level, respectively.

An F-test for overall significance of the empirical models rejects the null hypothesis (of no influence of explanatory variables) for both models. However, the estimation results reveal that a substantial part of the variation in the number of driving schools and notaries remains unexplained by the explanatory variables used in the empirical models.

¹⁶ $Population\ squared\ (in\ thousands) = \frac{Population * Population}{1,000}$

The variable *population* has a positive impact on the number of firms. The parameter estimate is significantly different from zero at the one percent level in both markets. As expected, the parameter estimate of the squared term of *population* is significantly different from zero and negative. This indicates that a disproportional increase in the number of potential consumers is necessary for new entrants to break even. The variable *young adults* does not contribute significantly to the explanatory power of both models. This result is particularly surprising for driving schools where young adults are the main target audience. A high share of young adults should increase the incentive to enter the driving school market. The empirical results, however, reject this hypothesis.¹⁷

The regional unemployment rate (*unemployment rate*) and the share of individuals without an Austrian citizenship relative to total population (*foreign*) both exert a positive impact on the number of firms in the two markets. Both variables can be interpreted as demand indicators. Ceteris paribus, demand will be low in municipalities which are characterized by high unemployment rates and a large share of foreigners. These municipalities should attract a smaller number of driving schools and notaries. The positive impact of the two variables (*foreign* and *unemployment rate*) on the number of firms thus is surprising.

High correlation between the independent variables *population*, *unemployment rate* and *foreign*, technically called multicollinearity, is one possible reason. Individuals with a foreign background prefer to live in urban areas (large population size) and face a higher chance of unemployment than Austrian citizens. If harmful multicollinearity is observed, this would suggest that *foreign* and *unemployment rate* are highly correlated with *population* and adopt *population's* positive coefficient.

¹⁷ Unfortunately, Asplund and Sandin's (1999a) paper on Swedish driving schools is hard to compare to these results. In contrast to this work, Asplund and Sandin (1999a) only take individuals aged from 16 to 24 as potential customers into account and, therefore, do not have a specific variable for the percentage of young adults in overall population. They obtain a significantly positive coefficient for potential customers (i.e. individuals between 16 and 24), but lack a statement about a high share of young adults' impact on the number of driving schools.

Table 4: VIFs

| Variable | VIF | Squared VIF | Tolerance | R-squared |
|-------------------|------|-------------|-----------|-----------|
| Population | 1.06 | 1.03 | 0.9395 | 0.0605 |
| Unemployment rate | 1.12 | 1.06 | 0.8922 | 0.1078 |
| Foreign | 1.18 | 1.09 | 0.8447 | 0.1553 |
| Mean VIF | 1.12 | | | |

Table 5: Correlations

| Correlation | Population | Unemployment rate | Foreign |
|-------------------|------------|-------------------|---------|
| Population | 1 | 0.0877 | 0.2445 |
| Unemployment rate | 0.0877 | 1 | 0.3283 |
| Foreign | 0.2445 | 0.3283 | 1 |

However, calculations indicate that all three variables are significant (*Table 3*) and weakly correlated with each other (*Table 5*), which are strong signs that harmful multicollinearity can be rejected (Joshi, 2012). Moreover, the variance inflation factors (VIF) do not detect harmful multicollinearity as well. The ‘rule of thumb’ states that multicollinearity is not severe as long as VIFs are smaller than ten (O’Brien, 2007). VIFs of *population*, *unemployment rate* and *foreign* –depicted in *Table 4*– are all close to one, thus harmful multicollinearity can be ultimately rejected.

A positive impact of unemployment rates and the share of foreigners on the number of firms in different regional markets can be explained when interpreting both variables as indicators of production costs (instead of indicators of demand). Standard labor market models suggest that high unemployment numbers reduce wages. Workers loose wage

bargaining power when the pool of unemployed is large and replacing current work force is cheap (see Greeg and Machin, 2012). Foreign employees also tend to accept lower wages than Austrian citizens.

Note that a high share of unemployed and foreigners mainly decreases wages of unskilled employees (like cleaning stuff) and, therefore, contributes to lower costs for notaries and driving schools. Furthermore, high unemployment rates and a large share of foreigners could also imply a decrease in rental fees. Hence, lower costs for hiring staff and office space increases the incentive to establish new firms, which could explain the positive impact of the regional unemployment rate and the share of foreigners on the number of firms reported in *Table 3*.

Bresnahan and Reiss' (1991) theory assumes spatial separation between markets; only firms within the local market compete with each other. The assumption of spatial separation of municipalities in Austria undoubtedly is very strong, since population density is high and most villages are separated by short distances only. Driving schools and notaries obviously engage in competition with firms from other municipalities. This cross-municipality effect will be particularly strong in municipalities with a large share of commuters. Individuals who commute to a different municipality on a regular basis can utilize services offered in other municipalities at very low additional costs. We thus include the variable *commuter ratio* to account for competition between firms from different municipalities.

Commuter ratio is supposed to measure the impact of individuals' mobility. A high share of commuters is observed in areas characterized by high population density due to short distances increasing the willingness to work outside the hometown. On the other hand, individuals living in geographically isolated villages rather choose a workplace in their hometown, i.e. these villages possess a low commuter ratio.

The relationship between *commuter ratio* and *number of firms* is negative and significant in both markets. Customers living in low mobility municipalities will rather access specific services in their own town than drive long distance to a rival outside the municipality. Hence, firms in low mobility municipalities face less competition from outside. Low competition from outside increases the number of local firms and implies a higher degree of competition inside the municipality.

Results from Ordered Probit model

Table 6: Ordered Probit model

| Ordered Probit | Notaries | Driving schools |
|------------------------|----------------------|----------------------|
| Ln(Pop) | 1.407*** (0.087) | 1.583*** (0.099) |
| Unemployment rate | 5.676** (1.659) | 4.788** (2.087) |
| Young adults | 1.169 (2.309) | 4.945* (2.863) |
| Foreign | 1.487 (1.145) | -0.790 (1.414) |
| Commuter ratio | 0.681*** (0.279) | 0.709** (0.356) |
| θ_1 | 13.056*** (0.866) | 15.359*** (1.032) |
| θ_2 | 14.114*** (0.888) | 16.148*** (1.051) |
| θ_3 | 15.079*** (0.921) | 17.005*** (1.077) |
| θ_4 | 15.933*** (0.972) | 18.111*** (1.137) |
| θ_5 | 16.534*** (1.019) | 18.864*** (1.217) |
| θ_{6+} | 17.039*** (1.059) | 19.480*** (1.285) |
| Number of observations | 2,349 | 2,349 |
| Pseudo R ² | 0.365 | 0.422 |

Remarks: Standard errors are in parenthesis. ***, ** and * indicates that parameter estimates are significantly different from zero at the 1%, 5% and 10% level, respectively. All markets with more than five firms are pooled in one category.

The Ordered Probit model discovers a positive significant impact of *population* and *unemployment rate* on the *number of firms*. Other demographic components (*foreign* and *young adults*) are insignificant again, except *young adults'* estimate for driving schools. *Commuter ratio's* coefficients are positive and significant in both markets. All cut points are positive and significant, indicating that the number of firms is not randomly distributed.

Furthermore, cut points increase with the number of firms, which implies decreasing profits when additional firms enter the market.¹⁸

The variable *Population squared* is not included in the Ordered Probit model estimations. The entry thresholds are estimated from a firm's profit function (6), which consists of variable profits per capita times the number of individuals. The variable profits per capita do not depend on the population size or its squared term, hence including *population squared* as an independent variable would be counterproductive. Further, the estimated entry thresholds are supposed to depict the positive exponential relationship between the number of firms and the population size.

Entry thresholds

The Ordered Probit model estimates for cut points and independent variables are required to compute entry thresholds. The exact derivation of entry thresholds is specified in Chapter 3.2.

¹⁸ The context between increasing cut points and lower profits as a consequence of a higher number of firms is demonstrated in equation (15) in Chapter 3.2

Table 7: Thresholds notaries

| Number of firms (N) | Notaries | | |
|---------------------|---------------|------------------------|------------------|
| | Threshold (S) | Threshold per firm (s) | Threshold ratios |
| 1 | 7,897 | 7,897 | |
| 2 | 16,717 | 8,359 | 1.06 |
| 3 | 33,424 | 11,141 | 1.33 |
| 4 | 61,340 | 15,335 | 1.38 |
| 5 | 94,160 | 18,832 | 1.23 |
| 6+ | 135,542 | 22,590 | 1.20 |

An Austrian notary market monopolist requires 7,897 potential customers to realize positive profits. A second notary enters the market when population size exceeds 16,717 individuals. This implies 8,359 potential customers per single notary. Three notaries require 33,424 potential consumers to break even, i.e. 11,141 individuals per firm.

We observe a small increase in thresholds per firm when a second firm enters the market and a sharp increase with a third and fourth entrant, i.e. threshold ratios are above one and increasing. Threshold ratios start to decrease when a fifth firm enters the notary market. However, threshold ratios stay above one, which implies that entry still intensifies competition. Summing up, the empirical results seem to indicate that every entrant strengthens competition. Entry thresholds peak when a fourth notary enters the market.

The results obtained for the Austrian notary market do not entirely correspond to Bresnahan and Reiss' (1991) findings, where relative competition intensification peaks when a second firm enters the market. Two hypotheses can explain this slight deviation. First,

$s_2/s_1 < s_3/s_2$ can imply that two firms are more successful in establishing a price cartel than three firms, hence duopoly prices are close or equal to monopoly prices and a second entrant does not require a higher number of potential consumers.

The second explanation is related to the impact of regulation. As mentioned in Chapter 4.2., the Austrian ministry of law decides about the notaries' location to ensure short distances for citizens. Consequently, small markets might have a higher number of notaries (compared to the situation without regulation), since these markets are more geographically exposed than large cities. A higher number of notaries in small markets would decrease the threshold for monopolists and duopolists and increase the threshold ratio s_3/s_2 in the empirical results.

Nahuis and Noailly (2010) apply the Bresnahan and Reiss (1991) framework in the unregulated Dutch notary market. Comparing their results to the Austrian notary market thresholds might provide some first evidence on the effects of regulation. Their results are reported in *Table 8*.

Table 8: Thresholds notaries Netherlands

| Number of firms (N) | Notaries NL | | |
|---------------------|---------------|------------------------|------------------|
| | Threshold (S) | Threshold per firm (s) | Threshold ratios |
| 1 | 5,663 | 5,663 | |
| 2 | 19,883 | 14,220 | 2.51 |
| 3 | 41,623 | 21,740 | 1.53 |

Source: Nahuis and Noailly (2010)

Taking Nahuis and Noailly's (2010) estimates as a benchmark, we notice that monopolist thresholds are rather similar in both countries (Netherlands: $s_1 = 5,663$; Austria:

$s_1 = 7,896$). However, thresholds in both countries develop in a different way. In contrast to the strong increase in the entry threshold caused by a second Dutch entrant, the Austrian s_2 is rather similar to the first threshold (s_1). This suggests that an intensification caused by the second entrant in the Netherlands is stronger than in the Austrian market. Similar results are observed as the number of firms increases further. Observing the threshold ratio s_3/s_2 , we notice a stronger competition intensification in the Netherlands again. Provided that Austria and the Netherlands are rather similar economies, we can attribute the different thresholds to differences in the level of regulation.¹⁹

Table 9: Thresholds driving schools

| Number of firms (N) | Driving schools | | |
|---------------------|-----------------|------------------------|------------------|
| | Threshold (S) | Threshold per firm (s) | Threshold ratios |
| 1 | 12,318 | 12,318 | |
| 2 | 20,309 | 10,155 | 0.82 |
| 3 | 40,154 | 13,385 | 1.32 |
| 4 | 80,554 | 20,138 | 1.50 |
| 5 | 129,491 | 25,898 | 1.29 |
| 6+ | 191,716 | 31,953 | 1.23 |

The results reported in *Table 9* suggest that a monopolist driving school needs about 12,318 customers to enter the market and be profitable. A second driving school can only enter when each firm serves 10,155 customers. The third threshold is equal to 13,385 potential

¹⁹ As mentioned in Chapter 4.2., Dutch notaries do not have a reference price and are not restricted to a certain district. Furthermore, citizens can compare notary prices over the internet.

consumers per firm. According to the estimated threshold ratios, competition is intensifying with every additional entry, except the entry of a second competitor. The threshold ratio s_2/s_1 equals 0.82, which is well below zero; hence a second firm requires a lower amount of potential consumers than a monopolist.

Threshold ratios below zero require some additional comments. This section provides three interpretations of this unexpected result. The first explanation focuses on a possible bias in the data of driving schools. The second and third discuss the implications of product differentiation and cartels for threshold ratios.

Casual observations of the driving school market suggest that many driving schools do not only offer services in their own district but also in neighboring areas. Many driving schools, especially in the countryside, offer courses in restaurants or public schools, to save customers from transportation costs to the next driving school headquarter. Unfortunately, these services are not registered in the 'Austrian Association of Driving Schools' dataset, since the dataset merely reports the location of the driving schools' headquarters. Driving schools often announce these courses in local newspapers, on blackboards or at their own homepage, which makes it impossible to collect a complete dataset including the services offered in other districts.

The impact of these courses is straightforward. Additional courses are mainly offered in small villages, close to the driving school's home base, where the number of other competitors is small. If we would treat the small villages where the service is offered identical to a village with one driving school -which is not a strong assumption since they offer the same services as regular driving schools- the number of municipalities with one driving school will increase substantially and the average population size in this group of municipalities will decline. In other words, a large number of small villages will switch from zero to one driving school in the dataset. This implies a decrease in the empirically estimated monopolist entry threshold. Consequently, the threshold ratio s_2/s_1 will increase.

Schaumans and Verboven (2011) stress the importance of product differentiation as an explanation for threshold ratios below one. Suppose we observe a monopolist driving school offering classes for future car drivers. A second possible entrant would at least require the

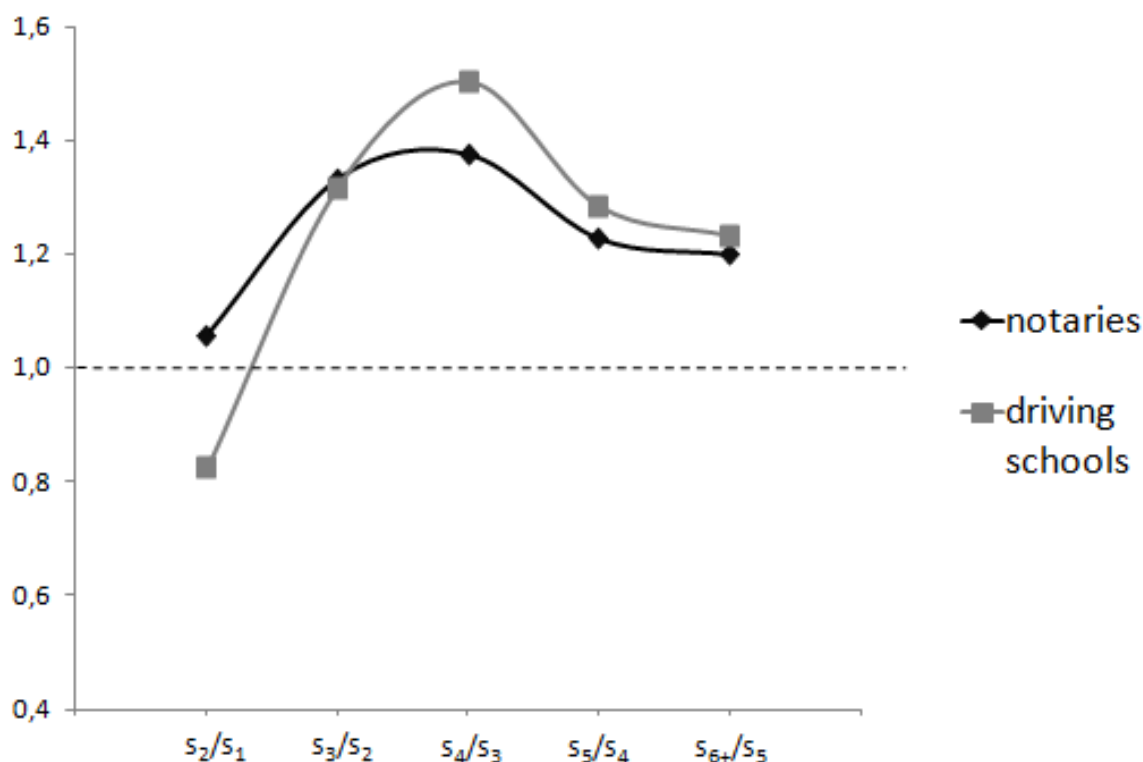
same threshold as the former monopolist to break even if prices stay at the monopoly level. However, by adding classes for motorcycle and truck drivers, the driving schools enlarge their product range and activate new consumers. Provided that the second entrant would offer a somewhat different service, the second entrant would not require the same population threshold as a monopolist. Product differentiation further reduces price competition and, thereby, also contributes to a reduction in entry threshold ratios.

Finally, low threshold ratios can also indicate the existence of cartels in driving school markets as we have seen in two recent examples in Austria (Chapter 4.3.). However, cartels typically imply threshold ratios equal or close to one, but cannot entirely explain threshold ratios below one. If we assume a monopolist charges profit-maximizing prices, two firms are not able to find a price where both firms realize positive profits at a lower number of potential customers than the monopolist entry threshold. Consequently, cartels cannot provide an entire explanation for threshold ratios below one.

Comparison

Driving schools and notaries are substantially different industries, as discussed in Chapter 4. Hence, it is not advisable to draw strong conclusions about competition or the effect of regulation on competition by simply comparing the results of these two industries (see Bresnahan, 1989). However, we can look for specific patterns in the development of competition as the number of firms increases. *Figure 8* shows the entry threshold ratios for both industries.

Figure 8: Entry threshold ratios



Entry threshold ratios for both industries are not substantially different. Both industries start with a small increase in entry threshold ratios. The ratio s_2/s_1 for driving schools is below one. When a fourth firm enters the market, competition seems to intensify the most in both industries and threshold ratios converge towards one, which can be interpreted as moving towards perfect competition.

6. Conclusion and Extensions

This thesis investigates the effects of entry on competition in the Austrian notary and driving school market by applying Bresnahan and Reiss' (1991) entry competition model. Entry threshold ratios are used as the main tool to determine changes in competition when an additional firm enters the market.

The empirical results suggest that new entrants in both markets increase competition. An exception is the entry of a second firm in the driving school market when the entry

threshold ratio drops below one. Every other threshold ratio is larger than one suggesting that an additional firm requires a higher number of potential customers than the previous market participants to break even. For example, by the time a fifth notary enters the market, the threshold is about two and a quarter times as high as the threshold required to accommodate a duopolist.

Both markets show a rather similar relationship between (regional) market size and the number of firms. The degree of competition seems to peak in both markets when a fourth firm enters the market. This finding seems rather surprising, since both markets experience very different characteristics concerning entry barriers and regulation. The Austrian notary market is an example for a highly regulated market, while entering the driving school market is comparatively easy.

The empirical approach used in the present study assumes that regional markets are separated. It needs to be emphasized that this assumption is questionable in the present context where regional markets are defined as individual municipalities. Austria has a high population density and individuals will also consume in markets (municipalities) others than their own; hence the assumption of separated markets is not completely fulfilled. The thesis seeks to account for the lack of separation by including the share of commuters as an additional control variable. Other researchers (Asplund and Sandin (1999b)) develop a different approach to control for cross- municipality effects. Asplund and Sandin (1999b) magnify their first research paper about competition in the Swedish driving school market by adding a test on the effects of nearby markets' distance and price level on the local driving school market. Adding information about prices and distances between municipalities to the dataset would be an interesting expansion of the present analysis as well.

Another interesting future research path is a closer observation of the effect of commuters. Unfortunately, the dataset only includes the number of out-, but not in-commuters. In-commuters could have the opposite effect of out-commuters by increasing the number of potential consumers in a municipality. If we observe the exact difference between out- and in- commuters, we would be able to investigate the effect of commuters in more detail.

Furthermore, Bresnahan and Reiss (1991) investigate firm entry in a purely static framework. However, in a market economy firms can also exit the market when they cannot realize positive profits. This possibility is (wittingly) neglected by Bresnahan and Reiss. Investigating entry and exit of firms simultaneously in a dynamic context by following Abbring and Campbell (2010), for example, would improve our understanding of the relationship between market structure and competition in the Austrian market for driving schools and notaries. However, this endeavor is beyond the scope of the present thesis.

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Abstrakt

Kurz zusammengefasst beschäftigt sich die vorliegende Masterarbeit mit dem Thema der Intensität von Wettbewerb und deren Messbarkeit. Untersucht werden zwei verschiedene Dienstleistungsmärkte in Österreich: der Markt der Notare und der Fahrschulen. Der theoretische Teil beziehungsweise die mathematische Durchführung basiert auf der Arbeit der Ökonomen Bresnahan und Reiss (1991).

Folgt man der ökonomischen Standardtheorie ist der Wettbewerb in Märkten einfach zu definieren. Wenn der Preis eines Gutes in einem Markt mit mehreren Bewerbern gleich seinen Grenzkosten ist, so wird dies als perfekter Wettbewerb definiert. Besteht ein Markt nur aus einer Firma, so sprechen wir von einem Monopol. In diesem Fall liegt der Preis über den Grenzkosten. Ein Markt mit mehreren Teilnehmern und einem Preis über den Grenzkosten wird als Oligopol bezeichnet. Oligopole und Monopole sind dadurch charakterisiert, dass kein perfekter Wettbewerb vorherrscht. Das Problem an dieser Theorie ist die schwere Messbarkeit, da Grenzkosten empirisch nicht messbar sind.

Bresnahan und Reiss (1991) lösen diese Problematik in dem sie Wettbewerb anhand der Anzahl der Firmen und der potentiellen Konsumenten in einem Markt messen. Bresnahan und Reiss (1991) berechnen die benötigte Anzahl an Konsumenten (Entry Thresholds), damit eine Firma positive Profite schreibt und in den Markt eintritt. Sie berechnen Entry Thresholds für jede Anzahl an Firmen (Monopolist, Duopolist,...) und erhalten anhand der Ratios der verschiedenen Thresholds Rückschlüsse auf die Intensität des Wettbewerbs. Anders formuliert, Märkte mit geringem Wettbewerb sind durch höhere Preise gekennzeichnet, die die Anzahl der benötigten Konsumenten verringern. Bresnahan und Reiss' Hypothese lautet daher, dass die Thresholds disproportional mit der Anzahl der Firmen in einem Markt ansteigen müssen. Ein Markt mit perfektem Wettbewerb ist durch eine fehlende Zunahme der Thresholds bei einem neuen Marktteilnehmer gekennzeichnet. In diesem Fall kann ein neuer Marktteilnehmer zu keiner zusätzlichen Preissenkung führen, da die Preise bereits am Level der Grenzkosten liegen. Somit bleibt auch der Threshold der N+1-sten Firma gleich dem der N-ten Firma.

Fahrschulen und Notare wurden ausgewählt, da sie durch große Unterschiede im Bereich der Regulierung und dem Einfluss des Staates gekennzeichnet sind. Notare arbeiten in einem hoch-regulierten Markt, in dem das österreichische Justizministerium unter anderem die Lage bestimmt und in die Preisgestaltung eingreift. Fahrschulen hingegen arbeiten in einem vordergründig relativ freien Markt. Jedoch wurden in den letzten Jahren einige Fahrschulen der Kartellbildung beschuldigt, womit der Verdacht besteht, dass der Markt nicht so kompetitiv wie erwartet ist. Diese Arbeit setzt es sich somit zum Ziel die Wettbewerbsintensität in beiden Märkten zu messen und gleichzeitig eine Aussage über den Einfluss von Regulierung auf Wettbewerb zu finden.

Die Ergebnisse zeigen, dass beide Märkte eine sehr ähnliche Entwicklung bezüglich der Entry Threshold Ratios nehmen. Eine zweite bzw. dritte Firma (Ausnahme: zweite Fahrschule) führt zu einer leichten Wettbewerbsverschärfung. Die stärkste Wettbewerbszunahme erfolgt beim Eintritt einer vierten Fahrschule bzw. eines vierten Notars. Danach nähern sich die Entry Threshold Ratios der Zahl eins, was auf eine Entwicklung in Richtung perfekten Wettbewerbs schließen lässt.

Außerdem wurde der Einfluss diverser Marktcharakteristika in einem Tobit Model gemessen. Auch hier zeigen sich beide Märkte äußerst ähnlich. In beiden Märkten herrscht beispielsweise eine signifikant positive Korrelation zwischen der Arbeitslosigkeit und der Anzahl der Firmen. Eine Variable, die in der vorhandenen Literatur noch nicht berücksichtigt wurde, ist der Prozentsatz der Pendler in einem Ort. Diese Variable soll den Einfluss der räumlichen Nähe zwischen den Märkten berücksichtigen, da die Annahme der isolierten Märkte in Österreich nicht komplett sichergestellt ist. In den Berechnungen ist der Einfluss der Pendler in beiden Märkten signifikant und negativ.

Curriculum vitae

Education

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|-------------------------|---|
| since 10/2011 | <p>Studies in Economics (Master-program) at the University of Vienna with focus on:</p> <ul style="list-style-type: none"> • Competition theory • Applied Industrial Organisation • International Financial Products (Swaps, FRAs, etc.) and Capital Markets • Exchange rate system and risks |
| 08/2013- 01/2014 | Studies in Economics at the Macquarie University, Sydney (AUS) with a stipend of the Non-EU Exchange Program |
| 10/2008- 07/2011 | Studies in Economics (Bachelor-program) at the University of Vienna |
| 02/2011- 06/2011 | Studies in Economics at the Universiteit van Amsterdam (NL) with a stipend from the Erasmus Exchange Program |
| 07/2007 | <p>Matura (diploma from secondary school qualifying for university admission) from the 'Bundesoberstufen-Realgymnasium Hagenberg' with a focus on:</p> <ul style="list-style-type: none"> • Communication and new media • Presentation techniques |

Work Experience

| | |
|-------------------------|---|
| since 05/2014 | <p>Allianz Insurance: Internship in Market Management</p> <ul style="list-style-type: none"> • Market research • SAS data programming • Internal reporting |
| since 04/2014 | Institute of Industrial Economics in Vienna: Research Assistant |
| 01/2013- 08/2013 | |
| 07/2009- 09/2009 | <ul style="list-style-type: none"> • Analysis of financial reports of companies listed on the Austrian stock exchange • Data analysis and graphical preparation in the 'Industry Book 2013' • Classification of companies based on their activities • Database management |
| 07/2006, 08/2007 | AMS Engineering Hagenberg |

