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Lábaj, Martin; Morvay, Karol; Silanic, Peter; Weiss, Christoph; Yontcheva, Biliana

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Martin Lábaj
Karol Morvay
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Martin Lábaj† Karol Morvay‡ Peter Silanič‡ Christoph Weiss§
Biliana Yontcheva§

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Abstract

The present paper provides first microlevel (indirect) empirical evidence on changes in the determinants of firm profitability, the role of fixed and sunk costs, as well as the nature of competition for a transition economy. We estimate size thresholds required to support different numbers of firms for four retail and professional service industries in a large number of geographic markets in Slovakia. The three time periods in the analysis (1995, 2001 and 2010) characterize different stages of the transition process. Specific emphasis is given to spatial spill-over effects between local markets. Estimation results obtained from a spatial ordered probit model suggest that entry barriers have declined considerably (except for restaurants) and the intensity of competition has increased. We further find that demand spill-overs and/or the effects associated with a positive correlation in unobservable explanatory variables seem to outweigh negative spill-over effects caused by competitive forces between neighboring cities and villages. The importance of these spatial spill-over effects differs across industries.

Keywords: entry thresholds, competition, Slovakia, transition, geographic markets

JEL codes: L22, D22, M13, R11

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†University of Economics in Bratislava, Vienna University of Economics and Business

‡University of Economics in Bratislava

§Vienna University of Economics and Business

1 Introduction and Literature Review

Entry of new firms and exit of others is an essential element of competition in a market economy. Investigating this issue in transition economies is especially interesting since "transition economies make a particularly good laboratory for understanding the dynamics of market evolution" (Estrin (2002), p.101). By studying the relationship between market structure (entry, exit and the number of firms in a market) and market size (population) for different regional markets, economists can gain insight into the determinants of firm profitability, the role of fixed and sunk costs, as well as the nature of competition. If competition is increasing in the number of firms, market size has to increase disproportionately to support additional firms.[1] Estimating entry thresholds from the relationship between the number of firms and an exogenous profit shifter (such as population) provides evidence on the toughness of competition (defined as the rate at which the post-entry equilibrium markup falls with the addition of competitors) for a product or industry. The attractiveness of this approach rests in the fact that it can be applied with modest data requirements. The relative degree of competition can be assessed on the basis of information on the number of firms, population size and other market demographics for a cross-section of local markets.

This entry threshold approach, pioneered by Bresnahan and Reiss (1990), Bresnahan and Reiss (1991) and Berry (1992), has been modified and extended in a number of ways. The effects of product differentiation are investigated in Mazzeo (2002), Davis (2006), and Schaumans and Verboven (2015). Mazzeo (2002) and Davis (2006) use direct measures of oligopolists' product characteristics and prices to measure the effects of product differentiation on competition and markups in local motel (Mazzeo) and cinema (Davis) markets. Product differentiation substantially lessens competition in these industries. Effects of product differentiation and firm heterogeneity are investigated in Schaumans and Verboven (2015) for different local service sectors in Belgium. The authors argue that entry typically leads to

[1] For example, if the smallest market size necessary to support one firm is equal to S ("monopoly entry threshold") then the market size (the number of inhabitants) must be greater than $2S$ to support two firms if competition reduces per-capita profits.

a market expansion effect which implies that traditional entry thresholds may underestimate the competition effects from entry. Related work by Berry and Waldfogel (2010) focuses on vertical product differentiation and investigates whether larger markets offer better products. In the case of restaurants, they find that the number of high-quality products increases in market size; for newspapers the authors argue that average product quality increases as markets grow without an increase in variety. Campbell and Hopenhayn (2005) consider differences in firm size (in addition to differences in the number of firms). They find that establishments are larger in larger cities, ceteris paribus. Carree and Dejardin (2007) differentiate explicitly between entry and exit of firms. The importance of imperfect information is investigated in Grieco (2014) who examines the effects of supercenters on rural grocery markets. Based upon the work of Abbring and Campbell (2010), Collard-Wexler (2014) estimates dynamic ordered probit models which allow the author to compute entry and exit thresholds separately. Using data for the ready-mix concrete market, the author investigates the evolution of market structure following an exogenous shock (a merger to monopoly) in a local market. The author's finding, that it takes between nine and ten years for a new firm to enter the market following the merger, suggests that the dynamics of market evolution can be quite low in sectors with significant entry barriers; data for a long time horizon are required to observe changes in market structure and firm conduct empirically.

The present paper extends the entry threshold approach in two dimensions: (a) we provide first empirical evidence on (changes of) market conduct and competition in a transition economy and (b) we devote specific attention to potential spill-over effects between regional markets and the spatial dimension of competition.

While the existing empirical literature exclusively focuses on market structure and competition in developed market economies, similar microlevel studies for transition economies are lacking.[2] The structure of a planned economy as well as the behavior of firms (or produc-

[2]Only a small number of empirical studies are devoted to analyzing entry and exit in transition economies so far. Roberts and Thompson (2003) estimate entry and exit rates across 152 3-digit industries in Poland. Similarly, Bojnec and Xavier (2004) investigate the determinants of firm entry and exit for a cross section of 3-digit industries in the Slovenian manufacturing sector. The present paper follows a different approach by

tion units) in this environment differs from the structure and conduct of firms in a market economy in many dimensions. During the communist regime, firms were not independent decision-making units and were not responsible for sales or pricing. Competitive rivalry was weak or nonexistent and entry of new firms as well as bankruptcy and exit of existing ones was effectively impossible (Estrin (2002)). Compared to market economies, firms were very large and market structure highly concentrated. With the collapse of communism, these countries experienced a fundamental change in their economic and institutional environment. State-owned enterprises were broken up and privatized and a large number of new (mostly small) firms were founded. This process of entry of new firms and the re-structuring of existing ones was instrumental in creating a market structure which is conducive to competition between independent rivals. Given the very specific structure of a centrally planned economy as well as the significant economic and institutional changes during the process of transition, an empirical analysis for individual industries can provide novel insights into the evolution of market structure and firm conduct in a transition economy.

An explicit consideration of the spatial dimension of competition constitutes the second novel contribution of the present empirical analysis. For many product markets, consumers face transportation (time) costs when switching between different suppliers. The entry-threshold approach assumes that transportation costs between different regional submarkets are prohibitively high so that individual markets are fully isolated. The equilibrium in one market must be independent – in terms of demand and competition – of other markets. While this might be a plausible assumption in some sparsely populated (rural) regions,[3] the high

focusing on industry dynamics within individual industries. Avdasheva et al. (2007) summarize the broader Industrial Organization literature on competition in transition economies with a specific focus on empirical studies for Russia.

[3]Bresnahan and Reiss (1991), for example, identify towns or small cities in the continental United States that are at least 20 miles from the nearest town of 1,000 people or more to estimate their econometric models. Similar procedures for identifying isolated markets are used in Collard-Wexler (2014), who uses a 20 mile threshold and merges towns which are very close to each other (so-called "twins"). Zang and Scott (2016) use a comparable approach to identify isolated markets for medical services, whereby they exclude all metropolitan service areas which are with-in 50 miles of another MSA, all small counties (with population below 50 000) and all counties which are less than 15 miles from another large county or less than 50 miles from an MSA. However, using a distance-based exclusion policy is not feasible in more densely populated markets, which has lead some authors to focus on size rather than isolation. To mitigate problems with

population density in many European countries raises doubts concerning the assumption of perfectly isolated regional markets. Although the "isolated markets" approach has generated a number of important applications, the extrapolation of the estimation results obtained from a sample of rural markets to urban areas is not possible. Aguirregabiria and Suzuki (2015) conclude: "Focusing on rural areas makes the approach impractical for many interesting retail industries that are predominantly urban" (p. 26). The importance of demand and competition spill-over effects between regions will not be identical over time and/or for all occupations: the process of transition was accompanied by significant investments in infrastructure as well as an increased mobility of consumers (due to an increase in income),[4] which should have strengthened the spill-over effects between individual regions for some industries.

In the present analysis, we aim at extending the concept of "entry thresholds" to a spatial context. We apply this approach to four professional service industries in a large number of geographic markets in Slovakia. The results from the estimation of a spatial ordered-probit model for three years (1995, 2001, and 2010) provide evidence on the transformation of market structure and firm conduct during different stages of transition from a centrally planned towards a market economy.

The paper is organized as follows. Section 2 briefly highlights relevant changes in the economic environment in Slovakia during the transition period. Section 3 presents the econometric specification. Section 4 discusses the empirical results and Section 5 summarizes and proposes possible extensions.

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overlapping markets in European countries, Carree and Dejardin (2007) use data for nonurban areas (all 455 Belgian municipalities whose local population is less than 20,000 inhabitants). Similarly, Schaumans and Verboven (2008) and Schaumans and Verboven (2015) retain only local markets with a population density below 800 inhabitants per square kilometer and a market size below 15,000 inhabitants.

[4]Note that investment in road infrastructure in 2001 (2010) was 2.79 (5.45) times higher than in 1995 (OECD (2013b)). The beginning of transformation process was characterized by low capital and labor mobility at intra- and inter- regional level (Morvay (2005)). The number of vehicles in Slovakia increased from 1.65 million in 1995 to 2.34 million in 2010. Besides, the number of passenger cars increased from 1.09 million in 2003 to 1.67 million in 2010 (MISR (2014)). The length of motorways increased by 60 % during 1995-2004 period (from 198 to 316 km) (EC (2006)) and reached 384 km in 2008 (EURF (2011)).

2 Transition in Slovakia and Market Description

Slovakia, a small open economy, started its transition as a part of the Czechoslovak Federation. As all countries in transition, Czechoslovakia experienced a deep transition recession in the early 1990s, during which output dropped significantly. The Slovak economy was hit much harder than its Czech counterpart (output dropped by more than 20% and unemployment rates exceeded 10%), as its industrialization during the communist period made it more dependent on markets in the Soviet Union and its Central and Eastern European satellites (Beblavý (2010)). However, Slovakia recovered quickly from the initial output collapse. Following its peaceful "Velvet Divorce" Slovakia gained independence from Czechoslovakia on 1 January 1993. Economic reforms slowed in 1994-98 but then regained momentum under a reform-oriented coalition government which restructured enterprises and banks and initiated large-scale privatizations of state-owned enterprises. These economic changes paved the way for Slovakia to enter the European Union in May 2004 and to adopt the euro currency at the beginning of 2009. The increasing pressure from foreign competitors may have had an additional impact on structural change and firm performance; the Slovak economy today is among the most dynamic of the Central and Eastern European countries (OECD (2013a)).

The mid 1990s characterize the early phase of transition. Some first reforms to establish more efficient markets were already introduced at this time; the liberalization of prices and foreign trade started in 1991. 1995 was the third year of an independent Slovak economy and the second year of growth after the transition depression. The economic environment was strongly influenced by a search for a specific "Slovak way" of transition (Marcinčin (2002)). Policy makers refused to continue with the harsh reforms initiated when Slovakia was still part of the Czechoslovak Federation (1990-1992). The so-called "Slovak way" of transition was characterized by a slowdown of reform measures, mistrust towards foreign investors, opaque privatization measures (as exemplified by "sale to pre-selected owners" procedures), exertion of political influence on investment flows and a revival of state paternalism and interventionism. In this period, the ownership structure of enterprises was highly fragmented (an outcome of mass privatization) and foreign strategic investors were absent. This period ended with the parliamentary elections held at the end of 1998 when a new government was formed.

The early 2000s was a period during which many corrections of the early transformation process were implemented. Macroeconomic stabilization was achieved and the economy was gradually directed towards EU integration. The new government focused on strengthening competitiveness and initiated the transformation process in sectors that had been protected during the previous regime (Morvay (2005)). More specifically, the following measures were implemented: the banking sector was restructured which eased financial flows and at the same time weakened political influence on the allocation of credit; institutions and procedures of regulatory interventions were changed (regulatory bodies independent from direct political influence were established); privatization mostly took place via international tenders; and the economy opened more significantly to foreign investors, which lead to increased foreign investment inflows.

In the third stage of the transformation process, the Slovak economy is well integrated into the EU (since becoming a member in 2004) and in many important dimensions compares well to Western European economies. After the 2009 economic recession, the economy in 2010 was growing rapidly again (OECD (2012)). Economic growth in this period was distinctively mono-structural (dependent on strong expansion in a small number of branches in the manufacturing industry, especially in the manufacture of passenger vehicles). Growth in these sectors was ensured by the reorientation of export, while domestic demand remained weak. The entry in the EU suggests that the economy has already reached a certain level of commensurability with the economic environment in the more developed economies of the EU even if income levels are still lagging behind significantly (Bartosvá and Želinský (2013)). After the transformation recession, gross income, measured by gross domestic product (GDP) per capita, increased rapidly, especially in the second half of the transition period. While GDP per capita was less then 48 % of EU-27 in 1995, it reached 52 % in 2001 and grew to more than 72 % in 2010 (Beblavý (2010), Sikulova (2014)).

While the macroeconomic process of transition has been well documented (Beblavý (2010)), there is limited information regarding the microeconomic forces behind this process. Melikhova et al. (2013) point to service industries as an important driver of economic growth. The present empirical analysis aims at investigating changes in entry behavior and competitive conduct in four service industries during the transition period.

3 Data and Empirical Framework

3.1 Data and Descriptive Evidence

The empirical analysis is conducted for four occupations (automobile dealers, electricians, plumbers and restaurants) in 2800 to 2900 regional submarkets in Slovakia for three time periods (1995, 2001, and 2010). The occupations chosen are dominated by small and independent sellers and are similar to those analyzed in previous empirical studies.

The number of firms in each occupation is obtained from the "Register of Economic Subjects" of the Slovak Republic which covers the whole population of firms in manufacturing and services. Information is collected on the location and main economic activity (classified according to the NACE Rev. 1 classification of industries) of each firm. From this we compute the number of sellers in the different local markets. Following previous research, markets are defined at the level of ZIP codes which roughly corresponds to the definition of a city or village in Slovakia. The number of cities and villages (regional submarkets) identified in this way in 1995 (2001 and 2010) is 2843 (2858 and 2926).[5] Data on population as well

[5]The main results in this paper are based on the full sample of towns from "Urban and Municipal Statistics". The larger cities (such as Bratislava and Kosice) are divided into a number of submarkets. Unfortunately, the exact location of each individual firm within the market is not available. Our empirical model thus follows previous research and assumes that the location of a firm within a market does not have any implications on its profits or on the degree of competition with other firms. The different number of regional submarkets identified for the three time periods is due to the "de-integration" of several municipalities into separate units over time. The village Žitavany, for instance, was established in 2002 by splitting the town Zlaté Moravce into two separate units. A detailed description of these changes can be found in MISR (2013) and SOSR (2014).

as demographic characteristics of the regional markets are obtained from the "Urban and Municipal Statistics". The population of cities and villages is highly skewed, ranging from 12 to 111800, with an average of 1879 in 2010 (at the end of our observation period).

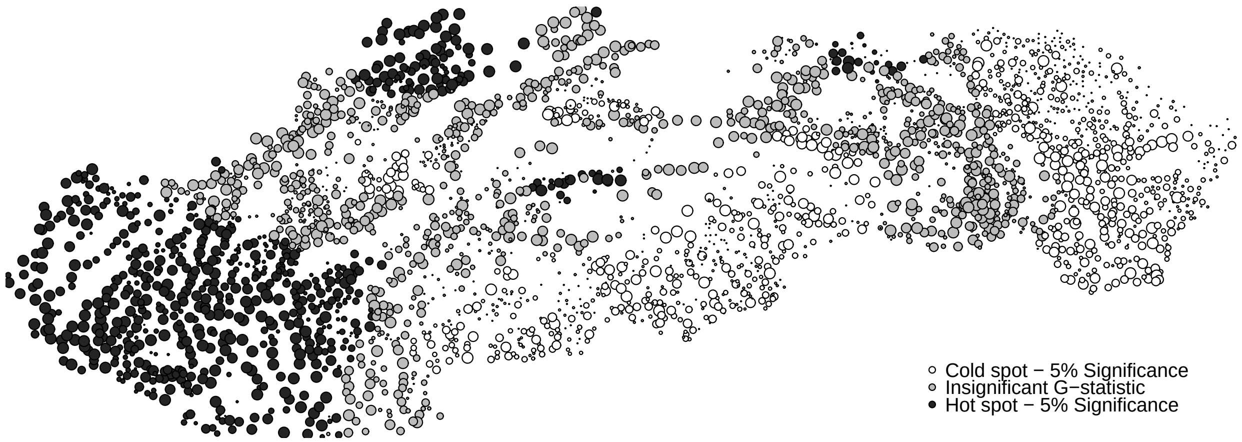
We control for several market characteristics such as wages, unemployment rates and the share of young and senior population. Data on wages and unemployment rates are taken from the "Regional Statistics Database". Unfortunately, we only observe these variables at the district level (for 79 districts). The share of population aged below 15 years and above 60 years for each market is obtained from the "Urban and Municipal Statistics". We supplement the dataset with information on the distances between cities and villages in order to capture the spatial distribution of occupations. Descriptive statistics for all variables are reported in the Appendix.

Tables 1 shows the number of regional markets with a given number of firms. Following previous research, we pool all markets with more than seven firms into one category since the number of observations for larger market sizes is insufficient to accurately identify entry effects for 8 or more competitors.

Note that the distribution of firm numbers differs substantially between periods, as well as between occupations. While the clear majority of villages and cities in 1995 did not have a single automobile dealer (nor an electrician or plumber), by 2010 there is at least one incumbent firm in about 50% of all regional markets. This trend is broken only by the restaurant industry. The sector had the broadest market coverage in 1995 when there were only 39 % of markets without a restaurant. Since then, market coverage slightly decreased; in 2001 (2010), 42 % (43 %) of local markets had no restaurant.

To illustrate changes in market structure over time, Table 2 shows the transition probabilities of the number of firms over the time period (1995 to 2010). All four markets are fairly dynamic. The transition probabilities for automobile dealers show, for instance, that a duopoly market in 1995 has a 12 % probability of being a monopoly market, an 11 %

Figure 1: Cluster analysis of the number of electricians in 2010 based on Getis-Ord statistics



Note: The size of each observation is determined by the population quantile in which it falls. Towns with a high population have been enlarged.

probability of having no supplier, and a 54 % probability of having two or more firms 15 years later.

The large share of local markets with no incumbent highlights the importance of explicitly accounting for spatial spill-over effects as inhabitants from these markets are forced to employ the services of firms from neighboring administrative units. The existence of these markets will thus contribute positively to the profitability of firms located in the neighborhood.

The importance of the spatial dimension in investigating market structure is further emphasized by the strong clustering of economic activities in space. Figure 1 shows the results of a Getis-Ord analysis in the market for electricians in Slovakia in 2010.[6] Urban areas appear to attract firms in neighboring administrative units, with small villages in the vicinity of Bratislava and Kosice, for instance, experiencing above average numbers of firms. The opposite situation can be observed in the low-income and structurally disadvantaged regions in East Slovakia where cities and villages are experiencing below average service provision.

[6]Similar results are obtained for the other occupations and time periods.

The Moran's I statistics[7] reported in Table 3 show that there is significant spatial correlation in the number of firms (as well as in the market characteristics). This clearly suggests that observations for the different cities and villages are not independent and that the spatial dimension needs to be taken into account explicitly in the econometric model.

3.2 Empirical analysis

The empirical framework closely follows Schaumans and Verboven (2015) and represents a simplified version of the pioneering work on the effects of entry and exit by Bresnahan and Reiss (1991). In modeling the market for retail and professional services, we assume that firms are identical: per-firm profits on a market with N firms are $\pi(N) = v(N)S - f$, where $v(N)$ are variable per-firm per-consumer profits, S is market size measured by the number of consumers and f is the fixed cost of production.

Since per-capita variable profits and fixed costs are unobserved, it is not possible to analyze the effects of the number of competitors (N) on variable profits $v(N)$ directly. However, from observing a specific number of firms in a market of size S, we can infer that the N incumbents break even, whereas the $N + 1^{st}$ potential entrant does not:

$$\pi_{N+1} = v(N+1)S - f < 0 < v(N)S - f = \pi_N$$

or equivalently:

$$ln\frac{v(N+1)}{f} + lnS < 0 < ln\frac{v(N)}{f} + lnS \tag{1}$$

The log-ratio of variable profits over fixed costs ($ln\frac{v(N)}{f}$) is characterized by a vector of observable market characteristics (X), firm fixed effects (θ_N), as well as an unobservable

[7]Moran's I (Moran (1950)) is an extension of the Pearson correlation statistic. For a given variable x it is calculated using the following formula:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

where w_{ij} is an element of the row-standardized spatial weights matrix W, which will be described in more detail in the following section.

error term (ε).

$$ln\frac{v(N)}{f} = X\beta + \theta_N + \varepsilon,\ \varepsilon \sim N(0, \sigma^2 I) \tag{2}$$

The entry condition in Equation (1) then yields the following entry rule:

$$y = N,\ if\ \theta_N \leq y^* < \theta_{N+1}$$

$$y^* = X\beta + lnS + \varepsilon$$

The parameters β can be estimated from an ordered probit model where θ_N and θ_{N+1} are the "cut-points" measuring the change in the variable profits to fixed costs ratio (in log form). Large differences between consecutive cut-points ($\theta_N - \theta_{N-1}$) imply that the N^{th} entrant has a significant influence on the competitive conduct of the incumbent firms, leading to lower mark-ups.

In estimating an ordered probit model for the number of firms in regional submarkets, the existing literature assumes zero correlation in the outcomes of neighboring units. The high population density of Central European countries, coupled with increasing mobility of consumers and trade between regional submarkets, however, cast doubts upon the assumption of perfectly isolated regional markets. A model which ignores the presence of spatial correlation in market structure and market characteristics is likely to provide biased estimates for entry barriers and competitive effects.[8]

In order to incorporate spatial autocorrelation in the latent profitability measure (y^*), we estimate a spatial autocorrelated ordered probit model, as outlined in LeSage and Pace (2009). This model implies that the entry/exit decision of each firm is not only determined by local market conditions (summarized in $X\beta$ and lnS) but can also be influenced by favorable

[8]Note that (some of) the existing empirical studies have attempted to address the spatial correlation between neighboring markets by including additional explanatory variables (such as the distance to the nearest town, the number of commuters leaving of the town on a daily basis and the population located within 10 miles of the administrative unit). While the inclusion of spatially lagged explanatory variables will capture neighborhood effects in market characteristics, the spatial correlation between neighboring regions in market structure (i.e. the correlation in the endogenous variable, the number of competitors) is ignored. We discuss different types of spill-over effects in more detail in the next section of the paper.

or unfavorable conditions in neighboring markets (represented by $\rho W y^*$):

$$y = N \ if \, \theta_N < y^* < \theta_{N+1}$$

$$y^* = \rho W y^* + X\beta + lnS + \varepsilon, \ where \ \varepsilon \sim N(0,1) \tag{3}$$

In the above equation W is a row-standardized spatial weights matrix with elements (prior to standardization) equal to $w_{ij} = 1/dist_{ij}^2$, where $dist_{ij}$ is the distance between regions i and j. [9]

The latent profitability measure (y^*) is assumed to follow a truncated multivariate normal distribution:

$$y^* \sim TMVN(\mu, \Omega)$$

$$\mu = (I - \rho W)^{-1}(X\beta + lnS)$$

$$\Omega = [(I - \rho W)'(I - \rho W)]^{-1}$$

In this spatial-lag model, the parameter ρ captures the effects of competition (via the truncation of the sampling distribution) and demand spill-overs (via changes in the mean of the distribution). Parameters are estimated using a Bayesian MCMC procedure from the R package `spatialprobit` described in more detail in Wilhelm and de Matos (2013). The method relies on data augmentation. With-in the estimation process values are generated for the unobserved profitability (y^*) based on the observed number of firms (y) via Gibbs sampling. The remaining parameters are then calculated conditional on the predicted values of the latent variable[10].

[9] We set $w_{ij} = 0$ if the distance between regions exceeds 30 kilometers. In choosing a cut-off value of 30 kilometers, we follow Bresnahan and Reiss (1991) who argue that towns are isolated if there are no competitors with-in a 20 mile radius. Estimation experiments show that our results are not significantly affected by changes in the cut-off value.

[10] The prior for β is normal with mean 0 and variance $T = I_K 10^{12}$, where K is the number of regressors. For the thresholds, we impose that θ_N should lie between θ_{N-1} and θ_{N+1} in order to ensure ordering but remain agnostic about the actual relationship using a uniform prior $\theta_N \sim U(\theta_{N-1}, \theta_{N+1})$. For the spatial correlation parameter we again choose an uninformative prior, using a beta (1,1) distribution to assign equal

The estimation of the model outlined in Equation (3) allows us to compute entry barriers and to investigate whether these have changed in the transition process. In particular, we are interested in the (changes in the) minimum market-size (population) necessary for the first firm to break-even (monopoly entry threshold S_1):

$$S_1 = exp(\hat{\theta}_1 - \bar{X}\hat{\beta} - \hat{\rho}Wy^*)$$

where $\bar{X}$ represents the mean value of X and $\hat{\theta}_1$, $\hat{\beta}$ and $\hat{\rho}$ are the parameter estimates from the model. A significant decline in S_1 between two time periods is indicative of a decrease in entry barriers.

To analyze firm competitive behavior and investigate changes during the transition, we follow Bresnahan and Reiss (1991) and compute entry thresholds (s_N) and entry threshold ratios (ETR_N):

$$s_N = \frac{exp(\hat{\theta}_N - \bar{X}\hat{\beta} - \hat{\rho}Wy^*)}{N} \tag{4}$$

$$ETR_N = \frac{s_{N^m}}{s_{N-1}} = exp(\theta_{N^m} - \theta_N)\frac{N}{N^m} \tag{5}$$

where N^m represents the upper limit of the number of firms in a market.[11]

While the existence of significant spatial spill-over effects ($\rho \neq 0$) causes entry thresholds values calculated from non-spatial estimation models to be biased, entry threshold ratios will not be affected as long as the parameter estimates for the "cut-points" (θ_N and θ_{N+1}) from the ordered probit model are unbiased.

Entry threshold ratios (s_{N^m}/s_N) are scale-free measures of the effect of entry on market conduct. If firms are identical and entry does not change competitive behaviour (mark-

probability to all values of ρ with-in the unit interval. More details on the estimation procedure are available in LeSage and Pace (2009) pp. 279-299.

[11] The ordered probit model restricts the number of categories. We follow previous studies and set $n^m = 7$. The loss of information is unlikely to be significant as the incremental change in the perceived competitive environment is likely to be small on a market with 7 vs. 8 firms and cities and villages with more than 10 competitors are likely to consist of sub-markets.

ups), then $s_{N^m}/s_N = 1$. Significant deviations of entry threshold ratios from one suggest that pricing strategies change as the number of firms increases. In other words, if a larger population is necessary for the next entrant to break even, entry has intensified competition and reduced mark-ups. Changes in entry thresholds and entry threshold ratios are indicative for changes in entry barriers as well as the intensity of competition during the transition period.

4 Results

Tables 4 and 5 report parameter estimates from a spatial ordered probit model. The results show that population, which is our proxy for market size S, positively affects the number of firms in all industries and periods. The parameter estimate for the log of population (α) is significantly different from zero across all occupations and time periods. Wages and unemployment rates as well as the demographic composition of the population in the market exert a significant impact in most equations. Because these variables summarize both demand and cost conditions, we do not attempt to draw structural inferences about the signs of their coefficients.

4.1 Entry barriers

Based on the parameter estimates of the spatial ordered probit model, the entry thresholds (s_N) for the different industries are calculated. The results are summarized in Table 6.[12] The estimated monopoly entry threshold population suggests that entry barriers for three retail professions (automobile dealers, electricians and plumbers) were lowered significantly in the 15 years of transition. Figure 4 in the Appendix illustrates the decrease in entry barriers for both time periods (1995 to 2001 and 2001 to 2010).

The range of the drop in population necessary for one firm to break-even varies across

[12] As economic theory constrains the parameter of lnS to 1, we normalize the other parameters when calculating entry thresholds (i.e. $S_N = exp\frac{\theta - \bar{X}\beta}{\alpha}$).

industries. From 1995 to 2001 (from 2001 to 2010) the population necessary for the first firm to break even decreased by 11 % (39%) for automobile dealers, 58 % (45%) for plumbers and 38% (68%) for electricians. It is important to note that this change was driven not only by direct policy decisions aimed at the firms but also by an increase in the real income level in Slovakia.

Note, however, that the transition towards a market economy followed a different path for restaurants. In this industry entry thresholds didn't change significantly during our observation period. The slight decrease in market coverage and the increase in the geographic concentration of restaurants in towns could be explained by decreased employment in the country-side and high employment and income growth in towns. Besides, a lot of universal and traditional village restaurants were closed down in the country-side while restaurants with more differentiated products were established in towns.

In our paper, we control for employment (unemployment) and income, but at district level only. In a sense, we use an aggregated proxy for unemployment and income in all towns and villages within the district. This may partially explain why we do not capture the effects described above in our estimation.

Furthermore, the share of household expenditures on restaurants decreased from 7 % in 2001 to 5 % in 2010, which may have mitigated the effect of growing income over this period and could have contributed to the relatively constant break-even population. On the other hand, the share of expenditures on maintenance and repair of dwellings (important for plumbers and electricians) increased from 1.9 % to 3 % in 2010. As such, the increase in the real income level in Slovakia could have had stronger impact on electricians and plumbers than on restaurants because they supply repair services to other firms and entrepreneurs and not only to population (households). While the real income measured by GDP per capita increased rapidly between 2001 and 2010, it was driven mainly by the growth in gross profits and to much lower extend by the growth of real wages. Therefore we can guess that the growth in demand was higher for electricians and plumbers than for restaurants.

We conclude that institutional changes and policy reforms implemented between 1995 and 2010 for most markets analyzed resulted in a substantial reduction of entry barriers, facilitating firm entry in markets where no incumbents were previously present. Very little change in entry costs occurred in the restaurant market.

4.2 Competitive effects

Changes in competitive pressure due to entry are measured by the ordered probit parameters θ_N. Based on these values we calculate entry threshold ratios (s_7/s_N) for all occupations. Table 7 reports these values for the four industries in our sample; the evolution over time is illustrated in Figure 2.

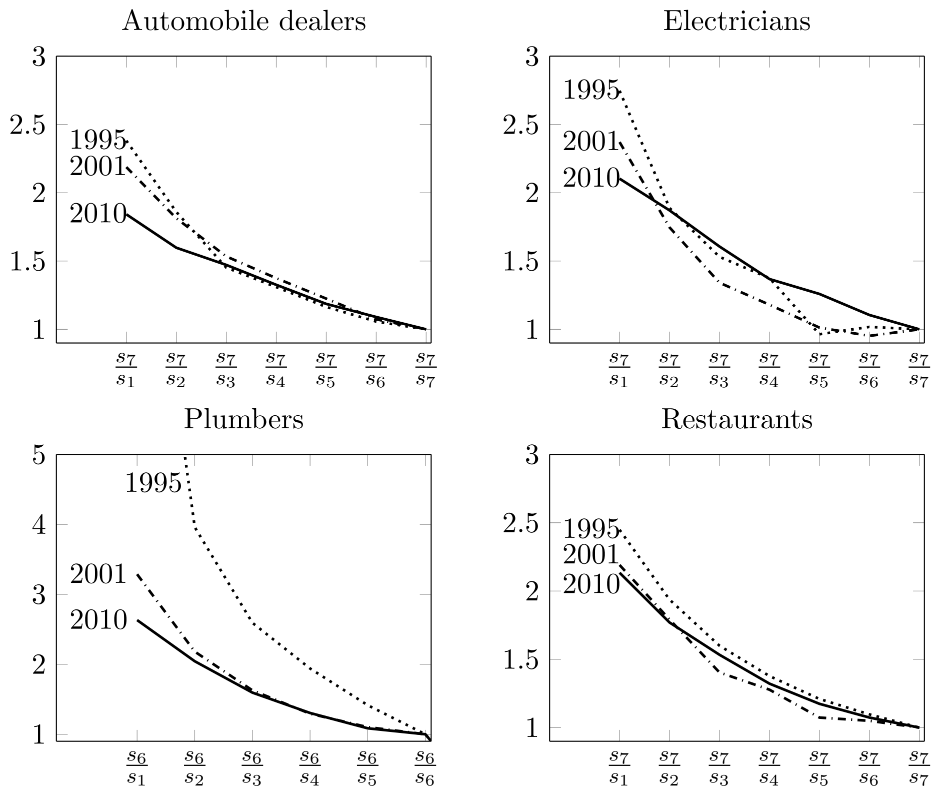
The results indicate that there are sizable differences in the mark-ups of firms who hold a monopoly position and those faced with competition. Our estimates show that the entry threshold on a market with 7 competitors is significantly higher than the population necessary for a monopolist to cover his costs. The estimated threshold ratio (s_7/s_1) ranges between 1.84 and 3.75 and is significantly different from 1 for all periods and professions[13].

For most occupations and time periods, the largest effect on competition occurred with the entry of the second and third firm. While the entry threshold ratios remain significantly different from 1 for the next 3 entrants, their absolute value is much closer to unity, indicating that mark-ups were close to the competitive benchmark. These results are consistent with findings from previous empirical studies (Bresnahan and Reiss (1991), Schaumans and Verboven (2015)).

The most substantial change can be observed in the automobile dealer and plumber market. While the early phase of transition (from 1995 to 2001) led to a significant intensification of competition for plumbers, the accession to the European Union (from 2001 to 2010) seems to have had the strongest impact on competition in the automobile dealer market. No clear

[13] While the estimated entry threshold ratio is even higher for plumbers in 1995, it is also coupled with higher standard errors, suggesting that it may overestimate the actual difference in competitive pressure across market structures.

Figure 2: Break-even population and ETRs in transition



trend can be observed in the market for electric services; large standard errors do not allow making conclusive statements regarding the change in competitive conduct in this market. Only minor changes are observed in the restaurant industry where ETRs decreased significantly between 1995 and 2001 but remained relatively constant in the subsequent period; we observe the smallest decrease in ETRs in absolute terms in this market.

In the case of restaurants, it is also important to note that entry in this market does not necessarily lead to more competition for potential customers. As argued in Bresnahan and Reiss (1991) and shown in more detail in Schaumans and Verboven (2015), entry might also increase product variety and thereby have a positive effect on consumers' willingness to pay. This countervailing effect of entry reduces entry threshold ratios (since it decreases effective competitive pressure). We would expect this "variety effect" of entry to become stronger with the increase in real income between 1995 and 2010. This may explain why hardly any change in entry threshold ratios is observed in the restaurant industry.

4.3 Spatial spill-overs

The parameter ρ measures the influence of the spatially weighted (unobserved) measure of neighborhood profitability (Wy^*) on the (unobserved) measure of profitability in the local market (y^*). The theoretical impact of these spill-overs on the number of firms in a local market is inherently ambiguous. At least three different effects can be relevant.

First, spill-over effects can be attributed to demand linkages[14] between neighboring markets. Firms not only benefit from an increase in local population (local demand) but also gain from a large population in neighboring markets. Note that 58% of the markets in our sample had no automobile dealer in 2001, for plumbers this number goes up to 70% and for electricians it reaches 77%. Inhabitants in these cities and villages will patronize firms in other (neighboring) cities; these neighboring markets will thus benefit from positive demand spill-overs.

While demand spill-over effects (to some extent) are taken into account in the existing empirical literature by including measures of the population in neighboring regions, countervailing spill-over effects due to competitive forces typically are ignored. The above numbers suggest that not all goods are produced locally but that some are imported from neighboring markets. Firms in a local market thus are exposed to competitive pressure from firms in neighboring markets, which counteracts the aforementioned demand spill-over effects (and implies a negative parameter value for ρ).

Finally, a non-zero value for ρ could be the result of unobserved differences in entry barriers across regions. Note that the pace of transition has not been the same in all parts of Slovakia and structural change and economic development are unevenly balanced between regions. While western regions of Slovakia are in closer proximity to EU markets and have a much better network of good roads and motorways, the poorer eastern regions border similar

[14] While theoretically it would be possible to isolate demand linkages by estimating an SDM model, where the spatially lagged population is one of the explanatory variables, the strong correlation between population and the number of firms makes it difficult to separate Wy^* from $WlnS$. This collinearity results in counter-intuitive results which point to a negative effect of neighborhood population and a positive effect from the lagged number of firms. The issue of collinearity is also aggravated by the fact that some control variables are available at district level leading to a close connection between X and WX.

poor regions in neighboring countries and suffer from significant transport infrastructure bottlenecks. Unobservable differences in the economic environment of larger regions would imply a positive spatial correlation in the error term and thus a positive parameter estimate for ρ.

Table 4 reports significant and positive parameter estimates for ρ for all periods and occupations. This suggests that spatial spill-over effects are important and that the effect of demand linkages and/or the positive correlation in unobservable regional characteristics seems to outweigh the negative spill-over effects associated with competitive forces between neighboring regions.

The positive spill-over effects are likely to wane with the decline of entry barriers, mainly because consumers are given the opportunity to buy locally and as such have a smaller incentive to make purchases in neighboring towns which should decrease the demand spill-overs across town borders. This decline is clearly visible in the estimates of the spill-over parameter for plumbers and automobile dealers.

Surprisingly, the opposite trend can be observed in the market of electricians as well as the restaurant market, where spill-over effects (parameter estimates of ρ) remain similar in all periods and even increase over the period 1995 to 2010. This result is intriguing for electricians, since this occupation experienced the largest inflow of firms. One may view the increase in the parameter ρ as indicative of the presence of disproportionally large pay-offs in high-profit neighborhoods. The pay-offs of entering in a neighborhood with high profitability, even when entry barriers are sufficiently low to increase exposure to competition, may increase if sellers provide services not only to households but also to corporate clients in related industries with agglomeration effects. If this is the case, the presence of a competitor in the neighborhood may be offset by the extra demand generated from the presence of firms from other industries.[15] With entry of new firms in the automobile manufacturing and ICT

[15] Schaumans and Verboven (2008) study the strategic complementarity of entry into related industries (pharmacies and physicians) in more detail. In their model, the marginal profits from entering in the pharmacy market increase when a physician decides to enter in the same regional market. They find empirical evidence for 847 local markets (defined at the town level) in 2001 in Belgium that entry into one profession

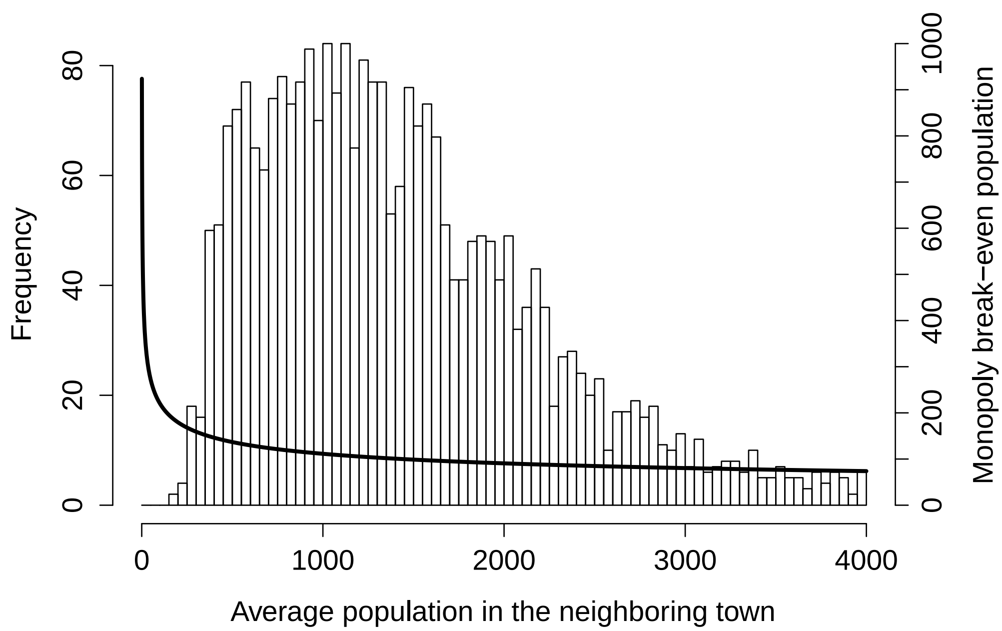
sector being spatially clustered and closely related to accession into the EU, one can see that the importance of proximity to profitable neighboring markets rose for electricians in 2010. While this effect is unlikely to be significant for retail automobile dealers and plumbers, it could very well be the case that the demand for electricians is higher in areas where large production capacities are present and hence generate spatial clustering.

The spatial spill-overs also appear to be increasing in the restaurant industry. The number of sellers in this category did not increase significantly in our observation period, as new entry was generally offset by exits of existing firms. As noted by Berry and Waldfogel (2010), this industry has a number of specifics not shared by other occupations. While positive spatial spill-over effects were relatively small in the first two observation periods, they increased substantially in 2010. This can be attributed, on the one hand, to improvements in infrastructure and a reduction in costs of visiting more distant restaurants. On the other hand, it is important to note that the size of the relevant geographical market might differ with respect to quality of the restaurant. Berry and Waldfogel (2010) suggest that "(l)imited service restaurants have a neighborhood as their geographic market while the market area for fancier restaurants is probably closer to the entire metropolitan area" (p.10). The observed increase in income levels might have led to a higher willingness to pay for variety and quality could thus explain why the relevant geographical market has expanded for restaurants.

As a final illustration of the importance of spatial spill-over effects, we estimate by how much the local break-even population changes when the average population in the neighborhood increases. The results are summarized in Figure 3. We find the expected negative relationship in all cases (having a large number of consumers close-by means that the sellers don't need to rely solely on local population). This effect is non-linear and hence depends on the point of the population distribution we choose to draw from. Looking at the market

has a positive effect on the profitability of entry into the other profession, suggesting that the entry decisions by firms of different professions are strategic complements.

Figure 3: Simulation of the relationship between local break-even population and neighboring population for electricians in 2010



Note: While there are towns with a population above 4000 individuals, these have been removed for the graph in order to improve readability (furthermore, the marginal effect of consumers wanes as population grows).

for electricians, for example, if the neighboring town has a population equal to the median of the population distribution, then a single consumer in the local market can be substituted by 16 consumers in the neighborhood, suggesting that at the median local firms expect to gain 6% of the profitability of the neighboring markets. This smaller weight of neighborhood population can be attributed both to transportation costs (which may be carried by the firm or the consumers). The decrease in the marginal effect of consumers is inherent in the model and not a result of the estimation results. However, one could argue that the lack of linearity in this case is desirable, as small-town sellers are not likely to be able to attract all consumers from large urban markets.

All in all, we find evidence for the presence of spatial interaction in entry decisions. Furthermore, this process appears to change during the transition process. The direction of these changes depends strongly on product characteristics.

5 Summary and Extensions

The present paper provides first (indirect) empirical evidence on the effects of entry on market conduct for a transition economy. We use the framework pioneered by Bresnahan and Reiss (1991) and estimate size thresholds required to support different numbers of firms for four retail and professional service industries. Firms' entry and exit decisions reveal information about the underlying (latent) profit function, the role of entry costs and the intensity of competition. The three time periods analyzed (1995, 2001 and 2010) characterize the different stages of the Slovakian transformation process. In 1995, the Slovak economy was in the early phases of a turbulent transition process with an unclear trajectory of its future route. Half a decade later, in 2001, the economy was in the process of relieving itself of post-socialist deformations and preparing for European integration. After being a member of the European Union for six years, the relevant institutions as well as the functioning of the Slovak economy in 2010 have already converged significantly towards Western European standards.

Consistent with these observations, our results indicate that the effect of entry on market conduct has changed over time. While entry threshold ratios tend to be larger than one and decline with the number of firms in most professions in 1995, the estimation results obtained for 2010 suggest entry threshold ratios much closer to one. This finding is indicative of a significant decline in entry barriers. [16]

The second novel contribution of the present paper concerns the explicit analysis of spatial spill-over effects in the entry-threshold approach. These effects should be particularly important in densely populated markets (such as those of Central European countries or large urban areas in general). Parameter estimates from spatial ordered probit models suggest

[16] In the 1990s, Slovakia was the country with the largest number of days required to start a business among the 18 countries listed in Table 3 in Estrin (2002). However, the country cut the time to register a business in half a few years later and, according to the "World Bank Doing Business" survey, was ranked among top reformers in the business environment in 2005.

that demand spill-overs and/or the effects associated with a positive correlation in unobservable explanatory variables outweigh negative spill-over effects caused by competitive forces between neighboring cities and villages. While these spatial effects are found to decline over the transition period for automobile dealers and plumbers, we observe an increase in the estimated spill-over parameters for electricians and restaurants.

Unfortunately, identification and isolation of the individual (counterveiling) spatial effects (demand spill-overs, competitive effects as well as effects associated with spatially correlated residuals) is not possible in the empirical model used in the present paper but is deferred to future research. Similarly, future work should provide additional insights into the importance of sunk costs and entry barriers for entry thresholds and firm conduct by supplementing the present approach with an analysis of prices and costs (Einav and Levin (2010)). Further, the impact of infrastructure quality and human capital could be considered explicitly in empirical models on entry, exit and competition. And finally, following the approach suggested in Pakes et al. (2007) or Abbring and Campbell (2010) would allow researchers to extend the static Bresnahan and Reiss framework to a dynamic setting. Explicitly modeling the dynamics of structural change is particularly important in order to further improve our understanding of the relationship between entry and competition in a transition economy.

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Table 1: The number of firms in regional submarkets in 1995, 2001, 2010

Number of firms	Automobile dealers			Electricians			Plumbers			Restaurants		
	1995	2001	2010	1995	2001	2010	1995	2001	2010	1995	2001	2010
	Number of local markets											
0	1,812	1,664	1,232	2,467	2,190	1,321	2,542	2,013	1,501	1,106	1,218	1,240
1	526	550	621	229	362	578	197	442	577	783	692	668
2	217	240	300	61	130	327	46	162	296	377	371	317
3	83	115	195	25	51	199	19	78	165	188	155	191
4	52	70	133	24	32	107	12	41	104	110	119	118
5	31	48	86	3	15	89	8	23	54	65	47	77
6	18	26	64	4	5	58	0	19	46	43	39	52
≥ 7	104	145	295	30	73	247	19	80	183	171	217	263
Total	2,843	2,858	2,926	2,843	2,858	2,926	2,843	2,858	2,926	2,843	2,858	2,926
	Share of local markets with a particular number of firms in %											
0	63.74	56.87	43.11	86.77	74.85	46.22	89.41	68.80	52.52	38.90	41.63	43.39
1	18.40	19.35	21.22	8.01	12.73	19.75	6.89	15.55	19.72	27.40	24.34	22.83
2	7.42	8.40	10.55	2.08	4.55	11.50	1.57	5.67	10.41	12.88	12.98	11.15
3	2.92	3.93	6.82	0.88	1.74	6.96	0.67	2.67	5.77	6.61	5.30	6.68
4	1.82	2.46	4.55	0.84	1.13	3.66	0.42	1.44	3.55	3.85	4.19	4.03
5	1.06	1.68	3.02	0.10	0.52	3.13	0.27	0.80	1.90	2.22	1.64	2.71
6	0.63	0.89	2.24	0.14	0.17	2.03	0.00	0.65	1.61	1.51	1.33	1.82
≥ 7	3.64	5.10	10.08	1.05	2.57	8.44	0.67	2.81	6.25	5.98	7.63	8.99

Table 2: Transition matrices: 1995 to 2010

		Number of car dealers in 2010							
		0	1	2	3	4	5	6	7
1995	0	0.59	0.24	0.08	0.04	0.02	0.01	0.01	0.01
	1	0.23	0.26	0.16	0.12	0.1	0.05	0.03	0.05
	2	0.11	0.12	0.24	0.16	0.09	0.08	0.07	0.14
	3	0.01	0.11	0.1	0.08	0.11	0.13	0.12	0.34
	4	0	0.1	0	0.06	0.12	0.06	0.13	0.54
	5	0	0	0	0.03	0.1	0.03	0.16	0.68
	6	0	0	0	0.11	0.06	0	0.06	0.78
	7	0	0	0	0.01	0	0.02	0.01	0.96

		Number of electricians in 2010							
		0	1	2	3	4	5	6	7
1995	0	0.51	0.21	0.11	0.06	0.03	0.02	0.01	0.04
	1	0.13	0.18	0.16	0.11	0.09	0.07	0.05	0.2
	2	0.05	0.07	0.07	0.1	0.11	0.08	0.15	0.38
	3	0.04	0.08	0	0.04	0.04	0.16	0.04	0.6
	4	0.04	0.04	0.04	0.12	0.12	0	0.04	0.58
	5	0	0	0	0	0	0	0	1
	6	0	0	0	0	0	0	0	1
	7	0	0	0	0	0	0	0	1

		Number of plumbers in 2010							
		0	1	2	3	4	5	6	7
1995	0	0.56	0.21	0.09	0.05	0.03	0.01	0.01	0.03
	1	0.21	0.18	0.18	0.12	0.05	0.05	0.06	0.16
	2	0.04	0.11	0.13	0.24	0.09	0.04	0.11	0.24
	3	0.11	0	0.05	0.21	0.05	0	0.21	0.37
	4	0	0	0	0.08	0	0.25	0	0.67
	5	0	0	0	0	0	0	0	1
	6	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	1

		Number of restaurants in 2010							
		0	1	2	3	4	5	6	7
1995	0	0.66	0.21	0.07	0.03	0.01	0	0	0
	1	0.43	0.32	0.13	0.07	0.02	0.01	0.01	0.01
	2	0.27	0.28	0.19	0.1	0.06	0.04	0.02	0.04
	3	0.14	0.21	0.19	0.14	0.12	0.06	0.05	0.09
	4	0.11	0.14	0.1	0.16	0.16	0.09	0.05	0.19
	5	0	0.14	0.11	0.12	0.14	0.18	0.06	0.25
	6	0	0.12	0.05	0.07	0.09	0.14	0.12	0.42
	7	0.01	0	0.01	0.03	0.04	0.04	0.04	0.84

Table 3: Spatial autocorrelation in firm numbers and market characteristics

Year	1995		2001		2010	
Variable	Moran's I	p-value	Moran's I	p-value	Moran's I	p-value
Firm Numbers						
Automobile dealers	0.138	0.000	0.200	0.000	0.267	0.000
Electricians	0.065	0.000	0.169	0.000	0.246	0.000
Plumbers	0.112	0.000	0.211	0.000	0.247	0.000
Restaurants	0.155	0.000	0.217	0.000	0.253	0.000
Market Characteristics						
Population	0.004	0.501	0.086	0.000	0.100	0.000
Wage	0.817	0.000	0.703	0.000	0.759	0.000
Unemployment	0.913	0.000	0.915	0.000	0.908	0.000
% Young	0.290	0.000	0.313	0.000	0.230	0.000
% Senior	0.278	0.000	0.279	0.000	0.259	0.000

Table 4: Parameter estimates obtained from a spatial ordered probit model for Slovakia in 1995, 2001 and 2010

Number of firms	Automobile dealers 1995	2001	2010	Electricians 1995	2001	2010
Population (log) (α)	0.9323***	0.9567***	1.0506***	0.7722***	0.8508***	0.9989***
	(0.0335)	(0.0367)	(0.0486)	(0.0434)	(0.0359)	(0.0473)
Wages	-0.0085***	0.0002	0.0001	0.0008	-0.0041***	-0.001***
	(0.0022)	(0.0007)	(0.0003)	(0.0029)	(0.0008)	(0.0003)
Unemployment (%)	-0.3717	-0.8070**	-2.1094***	-1.2989	-3.9555***	-1.6208***
	(0.6221)	(0.3955)	(0.4591)	(0.8714)	(0.5017)	(0.4375)
Young (%)	-6.428***	-6.9225***	-5.7315***	-3.6165***	-4.7688***	-4.1251***
	(0.9291)	(0.8049)	(0.6822)	(1.3306)	(0.9589)	(65.5416)
Elderly (%)	-4.0319***	-2.9757***	-1.724***	-2.4394**	-2.7801***	-0.3243
	(0.7435)	(0.6889)	(0.6472)	(1.1268)	(0.8620)	(0.6289)
θ_1	2.1573***	4.3283***	4.931***	4.7595***	2.4242***	4.6199***
	(0.6859)	(0.5030)	(0.3979)	(0.9696)	(0.5782)	(0.4032)
θ_2	3.0339***	5.1834***	5.8089***	5.584***	3.2617***	5.4291***
	(0.6859)	(0.5103)	(0.4241)	(0.9715)	(0.5797)	(0.4285)
θ_3	3.6428***	5.7321***	6.3211***	6.0594***	3.8226***	5.9864***
	(0.6884)	(0.5166)	(0.4487)	(0.975)	(0.5830)	(0.4498)
θ_4	4.0072***	6.1162***	6.7329***	6.3642***	4.1770***	6.4341***
	(0.6912)	(0.5214)	(0.471)	(0.9775)	(0.5878)	(0.4725)
θ_5	4.3249***	6.4394***	7.0842***	6.8108***	4.5004***	6.7399***
	(0.6941)	(0.5270)	(0.4906)	(0.9861)	(0.5905)	(0.493)
θ_6	4.5849***	6.7398***	7.3644***	6.9095***	4.7104***	7.0524***
	(0.6961)	(0.5320)	(0.5053)	(0.9879)	(0.5934)	(0.5114)
θ_7	4.7803***	6.9535***	7.6173***	7.0423***	4.8001***	7.3061***
	(0.6986)	(0.5335)	(0.5112)	(0.9895)	(0.5952)	(0.5176)
ρ	0.2954***	0.1952***	0.202***	0.2687***	0.2181***	0.2967***
	(0.0361)	(0.0350)	(0.0325)	(0.0655)	(0.0446)	(0.0315)
Observations	2,843	2,858	2,926	2,843	2,858	2,926

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

Table 5: Parameter estimates obtained from a spatial ordered probit model for Slovakia in 1995, 2001 and 2010

Number of firms	Plumbers 1995	Plumbers 2001	Plumbers 2010	Restaurants 1995	Restaurants 2001	Restaurants 2010
Population (log) (α)	0.4858***	0.7692***	0.8689***	1.1259***	1.0510***	1.008***
	(0.0373)	(0.0323)	(0.0394)	(0.0351)	(0.0363)	(0.0473)
Wages	0.0008	-0.0033***	-0.001***	-0.0056***	-0.0011	-0.0008***
	(0.0027)	(0.0007)	(0.0003)	(0.002)	(0.0007)	(0.0003)
Unemployment (%)	-1.5532*	-2.7388***	-2.2081***	-1.0819*	-1.927***	-1.2649***
	(0.8104)	(0.4326)	(0.453)	(0.5779)	(0.3889)	(0.4241)
Young (%)	-0.0027	-2.9360***	-4.1713***	-5.5108***	-6.2010***	-3.8981***
	(1.2387)	(0.8290)	(0.6838)	(0.7803)	(0.7028)	(0.647)
Elderly (%)	-1.4517	-2.4633***	-2.0243***	-1.8826***	-2.1562***	0.5796
	(1.0866)	(0.7722)	(0.6655)	(0.5927)	(0.5844)	(0.5948)
θ_1	3.4594***	2.5256***	3.5195***	3.8612***	3.9933***	5.0548***
	(0.904)	(0.5246)	(0.3925)	(0.615)	(0.4542)	(0.404)
θ_2	4.2427***	3.3712***	4.3417***	4.9053***	4.9364***	5.9422***
	(0.9069)	(0.5286)	(0.4062)	(0.6169)	(0.4593)	(0.4289)
θ_3	4.6454***	3.9031***	4.9092***	5.5774***	5.6290***	6.4954***
	(0.9087)	(0.5321)	(0.424)	(0.6218)	(0.4665)	(0.4524)
θ_4	4.926***	4.2992***	5.3342***	6.0696***	6.0420***	6.9349***
	(0.9119)	(0.5348)	(0.4391)	(0.6259)	(0.4734)	(0.4795)
θ_5	5.1875***	4.5977***	5.6878***	6.4669***	6.4616***	7.2793***
	(0.9182)	(0.5382)	(0.4538)	(0.6294)	(0.4810)	(0.504)
θ_6	5.445***	4.8176***	5.9174***	6.7827***	6.6769***	7.5532***
	(0.9231)	(0.5399)	(0.4638)	(0.6308)	(0.4851)	(0.5191)
θ_7		5.0386***	6.1581***	7.0602***	6.8908***	7.7802***
		(0.5414)	(0.4684)	(0.6329)	(0.4872)	(0.5246)
ρ	0.5725***	0.3835***	0.3364***	0.0877***	0.1109***	0.2742***
	(0.0359)	(0.0361)	(0.0323)	(0.033)	(0.0327)	(0.032)
Observations	2,843	2,858	2,926	2,843	2,858	2,926

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

Table 6: Per-firm entry thresholds for Slovakia in 1995, 2001, and 2010

	Automobile dealers			Electricians			Plumbers			Restaurants		
	1995	2001	2010	1995	2001	2010	1995	2001	2010	1995	2001	2010
	Total threshold population											
S_1	924	818	502	2,808	1,751	558	2,894	1,219	670	434	483	508
S_2	2,366	2,000	1,157	8,170	4,686	1,254	14,517	3,661	1,727	1,098	1,185	1,225
S_3	4,547	3,550	1,884	15,121	9,059	2,191	33,258	7,310	3,318	1,995	2,291	2,120
S_4	6,722	5,303	2,788	22,439	13,741	3,429	59,266	12,235	5,411	3,088	3,393	3,279
S_5	9,451	7,434	3,895	40,009	20,096	4,658	101,530	18,036	8,128	4,395	5,059	4,614
S_6	12,491	10,177	5,085	45,469	25,724	6,369	172,485	24,010	10,586	5,818	6,208	6,055
S_7	15,403	12,723	6,469	53,999	28,582	8,210		31,995	13,966	7,444	7,610	7,585
	Threshold population per firm											
s_1	924	818	502	2,808	1,751	558	2,894	1,219	670	434	483	508
	(29)	(29)	(22)	(338)	(105)	(21)	(535)	(57)	(24)	(12)	(15)	(18)
s_2	1,183	1,000	579	4,085	2,343	627	7,259	1,831	863	549	593	612
	(31)	(22)	(10)	(337)	(103)	(11)	(1,053)	(71)	(19)	(9)	(10)	(12)
s_3	1,516	1,183	628	5,040	3,020	730	11,086	2,437	1,106	665	764	707
	(36)	(24)	(11)	(325)	(112)	(12)	(1,291)	(83)	(23)	(10)	(12)	(11)
s_4	1,680	1,326	697	5,610	3,435	857	1,4816	3,059	1,353	772	848	820
	(35)	(25)	(12)	(301)	(108)	(15)	(1,442)	(93)	(27)	(10)	(12)	(14)
s_5	1,890	1,487	779	8,002	4,019	932	20,306	3,607	1,626	879	1,012	923
	(36)	(26)	(13)	(401)	(113)	(16)	(1,730)	(99)	(32)	(11)	(15)	(16)
s_6	2,082	1,696	848	7,578	4,288	1,061	28,747	4,002	1,764	970	1,035	1,009
	(36)	(27)	(14)	(327)	(107)	(18)	(2,260)	(98)	(32)	(11)	(14)	(17)
s_7	2,200	1,818	924	7,714	4,083	1,173		4,571	1,995	1,063	1,087	1,084
	(34)	(26)	(13)	(296)	(90)	(17)		(102)	(32)	(11)	(13)	(16)

Note: Standard errors are in parenthesis.

Table 7: Entry threshold ratios for Slovakia in 1995, 2001, and 2010)

	Automobile dealers			Electricians			Plumbers			Restaurants		
	1995	2001	2010	1995	2001	2010	1995	2001	2010	1995	2001	2010
	Per-firm entry threshold ratios (s_7/s_N)											
s_7/s_1	2.38	2.22	1.84	2.75	2.33	2.10	9.93	3.75	2.98	2.45	2.25	2.13
	(0.08)	(0.08)	(0.08)	(0.35)	(0.15)	(0.09)	(1.99)	(0.19)	(0.12)	(0.07)	(0.07)	(0.08)
s_7/s_2	1.86	1.82	1.60	1.89	1.74	1.87	3.96	2.49	2.31	1.94	1.83	1.77
	(0.06)	(0.05)	(0.04)	(0.17)	(0.09)	(0.04)	(0.65)	(0.11)	(0.06)	(0.04)	(0.04)	(0.04)
s_7/s_3	1.45	1.54	1.47	1.53	1.35	1.61	2.59	1.88	1.80	1.60	1.42	1.53
	(0.04)	(0.04)	(0.03)	(0.11)	(0.06)	(0.04)	(0.36)	(0.08)	(0.05)	(0.03)	(0.03)	(0.03)
s_7/s_4	1.31	1.37	1.33	1.38	1.19	1.37	1.94	1.49	1.47	1.38	1.28	1.32
	(0.03)	(0.03)	(0.03)	(0.09)	(0.05)	(0.03)	(0.24)	(0.06)	(0.04)	(0.02)	(0.02)	(0.03)
s_7/s_5	1.16	1.22	1.19	0.96	1.02	1.26	1.42	1.27	1.23	1.21	1.07	1.17
	(0.03)	(0.03)	(0.03)	(0.06)	(0.04)	(0.03)	(0.16)	(0.05)	(0.03)	(0.02)	(0.02)	(0.03)
s_7/s_6	1.06	1.07	1.09	1.02	0.95	1.10		1.14	1.13	1.10	1.05	1.07
	(0.02)	(0.02)	(0.02)	(0.06)	(0.03)	(0.02)		(0.04)	(0.03)	(0.02)	(0.02)	(0.02)
	Test ratio = 1											
$s_7/s_1 = 1$	***	***	***	***	***	***	***	***	***	***	***	***
Chi-sq.	276.08	210.33	101.90	25.37	80.54	168.32	20.06	201.03	276.33	377.04	286.24	194.03
$s_7/s_2 = 1$	***	***	***	***	***	***	***	***	***	***	***	***
Chi-sq.	235.04	290.15	267.59	26.70	75.55	400.40	20.52	181.39	422.72	579.55	491.69	331.80
$s_7/s_3 = 1$	***	***	***	***	***	***	***	***	***	***	***	***
Chi-sq.	122.20	191.32	206.07	21.29	36.60	281.34	19.11	131.55	282.11	422.62	234.91	258.10
$s_7/s_4 = 1$	***	***	***	***	***	***	***	***	***	***	***	***
Chi-sq.	83.19	131.05	118.67	17.12	17.14	141.39	15.00	76.38	154.97	258.47	137.78	119.16
$s_7/s_5 = 1$	***	***	***			***	**	***	***	***	***	***
Chi-sq.	32.91	65.15	49.71	0.35	0.19	82.39	6.42	35.41	53.49	107.28	13.03	41.46
$s_7/s_6 = 1$	**	***	***			***		***	***	***	***	***
Chi-sq.	5.38	9.49	14.64	0.09	2.25	17.73		14.10	22.78	30.77	7.49	9.49

Note: As s_7 could not be estimated for plumbers in 1995, the ETRs are calculated based on s_6. ***,**, and * indicates that the ETRs are significantly different from one at the 1%, 5%, and 10% level, respectively.

6 Appendix

Not to be published - Available from the authors upon request

Estimation procedure:

The following section, which relies heavily on LeSage (xxx), briefly outlines the estimation procedure used for the SAR ordered probit model.

1. *Calculation of the expected distribution of profitability based on observed market characteristics,* $p(y^*|\beta, \rho, W, X, S)$. For each observation the estimated mean latent profitability of the market is calculated based on the parameter estimates:

$$E(y^*) = \mu = (I_n - \rho W)^{-1}(X\beta + lnS)$$

as well as the covariance in the profitabilities due to spatial correlation:

$$H = Var(y^*)^{-1} = (I_n - \rho W)^T(I_n - \rho W)$$

2. *Update of the distribution based on the observed number of firms,* $\int_{\theta_N}^{\theta_{N+1}} p(y^*|y = N, \theta) = 1$. Based on the observed number of firms, y, we can impose restrictions about the actual realization of y^*, which will lie between ϕ_N and ϕ_{N+1} if there are N firms on the market. Our draw of y^* is thus from the following truncated multivariate distribution:

$$y^* \sim TMVN(\mu, H^{-1})$$

$$y^*_{min} = \phi_N, y^*_{max} = \phi_{N+1}$$

Draws for the unobserved profitability are obtained via Gibbs sampling from the conditional distribution of the profits in each town, based on the estimated profitability of all of its neighbors and the proposed parameter values: $p(y^*_i|y^*_{-i}, \beta, \rho, \phi)$, where a truncated univariate normal distribution is used.

3. *Update of the parameters determining the effects of market characteristics based on the calculated spatially weighted average of profitability.* Based on the sample of y^*, we can adjust our expectations about the true value of the parameters in β:

$$c^* = E[\beta] = (X^T X + T^{-1})^{-1}[X^T(I_n - \rho W)y^* + T^{-1}c]$$

In the above equation $(X^T X + T^{-1})^{-1} X^T(I_n - \rho W)y^*$ represents information coming from the data, while $(X^T X + T^{-1})^{-1} T^{-1} c = (T X^T X + I)^{-1} c$ is generated by the prior. Given our agnostic approach, for most variables the results should be driven by the former expression. Based on the sample of y^*, we also adjust our expectations about the variance of the parameters in β:

$$T^* = Var[\beta] = (X^T X + T^{-1})^{-1}$$

The more informative the data, the more concentrated the function we draw from becomes:

$$p(\beta|\rho, y^*) \propto MVN(c^*, T^*)$$

4. *Calculating the conditional distribution of ρ, $p(\rho|\beta, y^*)$.* The conditional distribution of ρ is equal to:

$$p(\rho|\beta, y^*) \propto |I_n - \rho W| exp(-\frac{1}{2}[(I_n - \rho W)y^* - X\beta - lnS]^T[(I_n - \rho W)y^* - X\beta - lnS])$$

This distribution does not take on a known form and needs to be estimated. This is done via numerical integration over the range of possible values for rho. A draw is then taken from the resulting distribution F, via a draw from a uniform distribution: $\eta \sim U(0, 1)$

$$\rho = F^{-1}(\eta)$$

5. *Recalculation of the entry threshold effects based on the observed spatially correlated data.* The threshold level of profitability, which allows N firms to break even is sampled from a uniform distribution with the following range:

$$\phi_N^{MIN} = max(max(y^* : y = N - 1), \phi_N - 1)$$

The minimum threshold for N firms cannot be smaller than the threshold for $N - 1$ firms, hence it must be larger than the largest profitability estimated for a market with only $N - 1$ firms.

$$\phi_N^{MAX} = min(min(y^* : y = N), \phi_N + 1)$$

The threshold should also be positioned so as to ensure that if N firms have entered, they have a profitability of at least θ_N.

6. Once the parameters have been updated, the loop is repeated. After sufficient burn-in rounds, the average effect is calculated by averaging over the draws from the MCMC sampler.

Table 8: Descriptive statistics ($N_{1995} = 2843$, $N_{2001} = 2858$, $N_{2010} = 2926$)

Variable	Mean	Std. Dev.	Min	Max
Number of automobile dealers in 1995	1.87	16.52	0	741
Number of automobile dealers in 2001	2.34	11.07	0	213
Number of automobile dealers in 2010	4.23	17.99	0	349
Number of electricians in 1995	0.19	0.70	0	12
Number of electricians in 2001	0.90	5.31	0	170
Number of electricians in 2010	3.08	11.34	0	248
Number of plumbers in 1995	0.15	0.60	0	11
Number of plumbers in 2001	0.98	4.01	0	99
Number of plumbers in 2010	2.13	6.94	0	132
Number of restaurants in 1995	3.53	29.46	0	1409
Number of restaurants in 2001	4.00	21.06	0	509
Number of restaurants in 2010	4.83	25.71	0	618
Number of pharmacies in 1995	0.30	1.97	0	77
Number of pharmacies in 2001	0.26	1.35	0	35
Number of pharmacies in 2010	0.51	3.14	0	81
Number of doctors in 1995	0.96	6.46	0	245
Number of doctors in 2001	1.89	9.52	0	159
Number of doctors in 2010	2.69	14.54	0	216
Number of dentists in 1995	0.59	4.41	0	169
Number of dentists in 2001	0.75	3.96	0	65
Number of dentists in 2010	0.87	4.81	0	85
Population in 1993	1878.77	10964.59	13	452253
Population in 2001	1790.00	6051.69	7	117000
Population in 2010	1858.00	5973.80	12	111800
Average nominal wage 1995	215.27	13.51	193	302
Average nominal wage 2001	363.10	42.08	294	657
Average nominal wage 2010	680.70	97.10	492	1327
Average unemployment rate in 1995	0.15	0.05	0.05	0.26
Average unemployment rate in 2001	0.23	0.07	0.04	0.35
Average unemployment rate in 2010	0.16	0.07	0.03	0.34
Share of population aged below 14 in 1993	0.21	0.05	0	0.51
Share of population aged below 14 in 2001	0.19	0.05	0	0.53
Share of population aged below 14 in 2010	0.16	0.05	0	0.69
Share of population aged above 60 in 1993	0.24	0.08	0.01	0.92
Share of population aged above 60 in 2001	0.23	0.07	0.02	0.89
Share of population aged above 60 in 2010	0.23	0.06	0.03	0.67

Figure 4: Changes in the break-even population (baseline: 2001)