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Firm's Evaluation of Location Quality: Evidence from East Germany

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Abstract

Our study provides evidence for firms' evaluation of location quality. We use a 2004 survey of 6,000 East German firms that contained questions on the importance and assessment of 15 different location factors ranging from closeness to customers and suppliers, transport infrastructure, and proximity to research institutions and universities, as well as questions about the local financial institutions and region's "image". The results show (1) a great deal of heterogeneity in terms of which firm- or regional-level characteristics are important in the evaluation of a specific location factor, (2) that the model's explanatory power is, overall, low and thus neither location characteristics nor internal factors are fully reflected in the perceptions, (3) that a firm's business situation and whether a location factor is considered important have explanatory power for perception. One policy-relevant conclusion that we derive from these findings is that location policy should consider firms' perception of a specific location in addition to improving the actual attributes of that location.

Keywords: Location Factors, Multi-Equation System, Perception Bias, Survey Data
JEL: R3, R12, L2

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1 Introduction

There is ample evidence for and broad theoretical reasoning behind the idea that location factors are important determinants in firms' decisions regarding location (Brown et al., 2009; Krugman, 1991) and foreign direct investment (FDI) (Head and Mayer, 2004). These factors are also determinants of a firm's productivity (Haltiwanger et al., 1999), innovations (Jaffe et al., 1993; Stephan, 2014), and even growth (Hoogstra and van Dijk, 2004). Obviously, however, the significance of location factors differs across sectors and depends on firm characteristics, such as, size, age, sector, and organizational structure (Brouwer et al., 2004).

Many authors have explored the relevance to firms of various location factors. This body of work includes research on agglomeration effects such as urbanization (Barrios et al., 2006) or localization effects (e.g. Guimarães et al., 2004; Henderson, 2003; Martin et al., 2011; Rigby and Essletzbichler, 2002) which are often linked to knowledge spillovers (Jaffe et al., 1993; Adams and Jaffe, 1996; Baldwin et al., 2010). Other work focuses on market size and market access (Head and Mayer, 2004), regional human capital endowment (e.g. Moretti, 2004), labor force with particular emphasis on the labor mix (e.g. Baldwin et al., 2010), and local public policy in regard to tax rates, subsidies and fees (Basile et al., 2008). Whereas there is an enormous literature on these topics, studies on East Germany using firm level data are rare.

Moreover, the literature looking on the importance to firms of location factors usually neglects a closely related issue, namely firms' *perception* of the quality of location characteristics. Because there is no obvious reason to expect that firms' evaluation of the location characteristics is reflective of the location's "true" quality, the perception of quality is probably more important than the actual location quality when it comes to firms' expectations and decisions making. The latter may be the result of internal organizational structure, internal processing and decision making processes, requirements based on specific relationships with other firms, customers or institutions, and the like (e.g. Bathelt and Glückler, 2011). Research in this field focuses on the one hand on the determinants of perception (McDermott and Taylor, 1996; Meesters, 2004) with evidence hinting at location specific characteristics (i.e., external factors) and firm-specific characteristics (i.e., internal factors) being the most important variables for explaining perception. On the other hand there is also research that demonstrates the impact of this perception on firm behavior such as location decisions (Strange et al., 2006) or innovation activities (Czarnitzki and Hottenrott, 2009).

We argue in this study that previous research, in addition to generally ignoring

firms' perception, has overlooked another important issue. Because acquiring, handling and processing information is costly, firms are likely to spend more time on collecting information about those location factors that are important to the firm's business activities and less on those it views as less important. As a consequence, evaluation of a location factor's quality will depend on how important this factor is to the firm. Thus, *importance* is another variable with the potential to explain firms' perception of location quality.

We focus, therefore, on the determinants of perception of location factor quality. Specifically, we examine to what extent firm and regional characteristics explain perception and whether a firms's self-reported importance of a location factor adds additional explanatory power.

We take a look at East-Germany in this study and employ a large survey on the innovation behavior of about 6,000 East German firms (companies) that was conducted by the DIW in 2004. This survey provides unique insight into a huge number of firms active in East Germany after reunification.[1] Although information on the perception and importance of location factors is also available in other data (e.g. the IAB-Establishment Panel), the DIW data base is unique in its focus on companies whereas the IAB-Establishment Panel considers establishments. The behavioral approaches of the theory of the firm we employ below refer to organizational structure, internal processes and the like that are chiefly determined on the company level.[2] Hence, the DIW data base is better suited for exploring our research questions. In contrast, the IAB-Establishment Panel has not been systematically used to study the research question addressed in this paper. For instance, Fischer et al. (2007) use the 2006 IAB-Establishment Panel data to describe how important location factors are according to establishments' self-reports and how satisfied establishments are with the local quality of important location factors. That study, however, neither applies econometrics nor considers a possible link between perception and importance of location factors.

Moreover, the questionnaire was fielded 10 years after reunification, meaning that most of the initial structural change and strong policy interventions had already been implemented and the initial shocks already smoothed out. However, due to these very drastic changes, the strong pressure exerted on firms, and the vast amount of public discussion on the regional economic situation we expect that firms

[1] This data base was previously employed by Lejpras and Stephan (2011) and Stephan (2014) to study the impact of location factors on spin-offs' innovation. A related study by Lejpras et al. (2011) uses the same data to analyze the effect of location factors on firms' competitiveness.

[2] We use the term "firm" as our main concept but specify it as a "company" when working with the DIW data base.

will be particularly aware of the characteristics of their locations. Their perceptions, therefore, should be less due to the absence of knowledge about general characteristics of a location, which we could not test for due to missing information, and more strongly based on other determinants.

There could be interdependence between importance and assessment, as a firm's importance assessment might influence the quality evaluation of the respective location factor. This issue is addressed in our empirical analysis by specifying a multi-equation system where importance and assessment are endogenous variables and determined by location and firm characteristics. In addition, we include the firm's profit situation as another explanatory variable which, however, also is endogenous. In fact, the empirical results show that a firm's profit situation is a good predictor of the firm's location assessment, and, interestingly, for a number of location factors the direction is negative.

We also find evidence that for a number of location factors the importance of the factor has explanatory power for the quality evaluation, but this occurs in a non uniform matter. We investigate this phenomenon in more detail and develop hypotheses to explain it. Our research also give rise to several interesting policy recommendations as location quality might be perceived very differently by different types of firms. We find strong heterogeneity among firms regarding which location factors are viewed as important and how those factors are evaluated.

The survey on which our analysis is based contains a unique list of 15 location factors, ranging from closeness to customers and suppliers, supply of qualified labor, intra and supra regional transportation links, and proximity to universities and research facilities, to the quality of public administration and local business promotion and support by the federal state (*Länder*) government. This rich information regarding location factors enables us to study the location situation and its assessment by East German firms 15 years after the fall of the Wall. Although most of the large infrastructure projects had been completed by the time of the survey, several long-lasting structural problems were already visible. Our results are also useful for comparing interregional differences in firms' perceptions of location quality.

The paper proceeds as follows. First, a literature survey is conducted to derive the hypotheses that will guide our empirical analysis. Second, location factor assessments of East German regions and firms are presented via descriptive statistics. Finally we present the regression results of the study, as well as several robustness checks, and draw conclusions.

2 Literature Review and Hypotheses

In this section we follow Hayter (1997) and explicitly distinguish between *location factor*, *internal factor* and *external factor* (see also Grabow and Henckel, 1995).

Location factors include:

- hard location factors such as
  - closeness to relevant markets (clients, supplier),
  - supply of training and qualification facilities (skilled workers, education supply),
  - accessibility to actual or potential markets (intra-regional transport links, supra-regional transport links),
  - proximity to knowledge-creating public institutions (research institutions and universities).
- soft location factors such as
  - access to and quality of public and non-public institutions (quality of local banks, of the local labor office, and of the state and local administration, and image of the region).

Note that the way in which the survey questions were posed implies that the location factors are not necessarily "true" characteristics of the geographical location, which we define as external characteristics.[3] Instead they should be understood as factors tied to the specific firm's location and depend, among others, on the firm's relations (networks, embeddedness etc). This means that firms at the same location could evaluate the same location factors differently.[4]

External factors, that is, regional location characteristics are directly quantifiable general characteristics of a region. We consider external factors to include general accessibility independent from the purpose of traveling (travel time to next central place), the general performance of the local labor market (local unemployment rate), the general education level (local student to employment density), the diversification of industries as a measure of industry structure or localization economics (Combes et al., 2004), and settlement type.

Internal factors are firm characteristics such as profits, share of local and export sales, skill level of employees, sector in which active, business type, size, age, former location experience, location of headquarters, and former innovation activity.

[3] "True" refers to verifiable (or measurable) characteristics.

[4] Further discussion of the problematic nature of the term *location factor* can be found in Bathelt and Glückler (2011).

The literature suggests that the impacts some location factors have on perceptions and decisions depends on the firm's characteristics (internal factors) and also on external factors (region characteristics) and that there might be interactions among several location factors. Moreover, as location factors might be complements of or substitutes for each other, it is necessary to consider firm characteristics and external factors as determinants of a location factor's importance.

For instance, concerning van Dijk and Pellenbarg (2000) find that external factors are more important than internal factors when it comes to firms' location decisions; other studies have found both types to be important (Strange et al., 2006). There is little evidence as to these factors' impact on evaluation of location quality; however, what evidence there is points to both internal and external factors being important determinants (McDermott and Taylor, 1996; Meesters, 2004). In general, the significance of external factors will depend on firm characteristics and, often, on other external factors.

From an economic perspective, the investment and location (spatial investment) decisions of firms are believed to be based on a firm's expectations about the present value of future profits. These expectations depend, among others, on internal factors (firm characteristics showing firm heterogeneity, Helpman et al., 2004; Chen and Moore, 2010; Mayer et al., 2010), past experience, entrepreneurial skill (Audretsch et al., 2012), and on external factors (region characteristics, including location factors such as agglomeration effects, market access, and costs, Mayer et al., 2010).

However, such decisions are plagued by several problems:

1. **Imperfect knowledge**: Because this information is costly or not fully available, particularly when it comes to future profits and location quality, firms have to base their decisions on their own perception of location quality. This problem may arise when the location under consideration is distant and the firm has no prior experience with the location. Moreover, information about some factors may be unreliable, not available to the firm, or simply nonexistent.

2. **Internal processing of information**: It might also happen that due to information costs and/or non-optimal knowledge processing within the firm, the firm does not collect full information or bases its decision on biased information. Specifically, as behavioral approaches emphasize, perception often reflects the preferences and attitudes of managers (McDermott and Taylor, 1996, provide evidence) and can be the outcome of the behavior of a coalition of different actors whose behavior and decisions are determined by bounded

rationality, uncertainty, learning, adaptation, search and internal conflicts (Cyert and March, 1963). Perceptions further depend on the capacities of decision makers within firms (Pred, 1967), including learning abilities (Lundvall and Johnson, 1994) and learning capabilities (Maskell et al., 1998) as well as internal rules (Cyert and March, 1963), routines (Nelson and Winter, 1982), habits and rituals (Hodgson, 1988).

3. **Social context**: Another branch of the literature emphasizes that social norms, social structure, and political institutions also influence information processing and decision-making behavior and, consequently, the firm's perception of information (Powell, 1990; Zukin and DiMaggio, 1990).[5]

Indeed, there is evidence that perception does matter when it comes to firms' location decisions (Strange et al., 2006) and innovation policies (Czarnitzki and Hottenrott, 2009).

We expect that the internal factors are the dominant determinants of the importance of a location factor because they represent internal processes of the firm and dynamic learning processes, as well as the organizational structure, past experience and entrepreneurial knowledge which itself depends on experience (e.g., age). Furthermore, internal factors represent organizational and financial capacity (e.g., size)[6], and the quality of workers (human capital) as well as specific internal skills and capacities necessary for translating location factors into success. Therefore, we expect internal factors to be the main determinants of the importance of a location factor.

Because internal factors determine a firm's capacity for and quality of evaluation, they will of necessity be key in the assessment of location factors. Nonetheless, such an assessment is chiefly based on the situation at the location, which is controlled by external characteristics. Therefore, external characteristics should exert a first-order effect, while the internal process mainly transfers the characteristics of the location into an internal assessment. We expect that internal characteristics are, thus, of minor order. Our expectation is even stronger when considering a non-behavioral concept of a firm. Hence we expect that location characteristics are the main determinants of the evaluation of the quality of a location factor. Accordingly, our first hypothesis is:

Hypothesis 1 *Whether a location factor is assessed as important or not can be chiefly explained by firm characteristics such as age, size, industry, type of activity*

[5] See also the overview of the geographer's theories of firms by Taylor and Asheim (2001).

[6] Arauzo and Manjón (2004) provide evidence that large firms take neoclassical approaches to deciding on location, whereas small firms follow other types of decision rules.

and other firm-related factors. On the other hand, the firm's quality evaluation of a specific location factor can be chiefly explained by location characteristics.

The second hypothesis is formulated as

Hypothesis 2 *A firm's assessment of location factor importance and the assessment of location factor quality are interrelated.*

The reasoning behind Hypothesis 2 is that it is likely that cost minimizing firms will expend more resources on evaluating the quality of location factors if these are relatively more important to the firm's operation and performance. We thus expect a significant effect when regressing location factor assessment against location factor importance. The sign is not clear a priori, because spending more efforts on the assessment could also imply that the factor is considered to be of lower quality than previously assumed. However, this might not necessarily be the case. First, an evaluation made with more effort might result in the same assessment as a rule-of-thumb assessment. To examine this second hypothesis we need to consider region- and firm-specific control variables and the potential effect of importance on assessment.

One interesting and related strand of literature emphasizes that collection of information about location quality is not only costly, but the results can be uncertain. Therefore firms might try to solve these problems by choosing regions that implicitly insure against the consequences of information deficiencies, usually agglomerations, urbanized regions or regions with clustered sectors (Strange et al., 2006). Perceived quality does not play much of a role in such a choice and will not be endogenously linked to the importance that the firm places on this location factor. Though this might decrease the influence of importance on evaluation, we expect that this effect is relatively weak and Hypothesis 2 will still hold.

We also expect that a firm's evaluation depends on its business situation. Firms may ascribe part of their economic performance to location factors.[7] Furthermore, struggling firms might be inclined to perceive their location environment more negatively, and vice versa, well-performing firms might be inclined to see their location in a positive light. Additionally, growing firms might experience limitations of their current location, for instance, not enough qualified labor or an insufficient supra regional transportation system. These reasoning leads us to our next hypothesis:

Hypothesis 3 *The firm's business situation has an influence on its evaluation of location factor quality.*

[7]This is the basis of location and urban economic theory where firms willingness to pay for the location factor land increases with their economic performance.

However, the direction of this impact is not clear. A location factor such as quality of local institutions, for example, may be assessed as contributing to the good performance whereas another factor, for instance, scarcity of high-skilled labor might impose restrictions on an even better performance.

Hypotheses 1-3 focus on internal and external factors in general. We now develop hypotheses concerning specific factors.

Internal factors

Firm size. Large firms can use a relatively larger number of specialized employees and other resources to evaluate location factors. They also have a stronger need to do so because making a wrong location decision will be relatively more expensive for them (Brouwer et al., 2004). Larger firms also have another internal organization than small firms affecting internal processing of information and its outcome (see above). Hence, they should assess the importance of factors in a different way from that done by smaller firms. Whether this implies that factors are evaluated better or worse is a priori ambiguous, but at the very least, we expect *firm size* to be significant.

Firm age. There is evidence that older firms are less mobile (Brouwer et al., 2004). One reason is that they might otherwise lose their established embeddedness in a region with strong local networks. Hence, we expect that they invest less in the evaluation of location factors. In addition, due to past experience (Audretsch et al., 2012) they may have other routines and internal processes resulting from long term learning and development, which are used in the internal assessment of the importance of a factor as well as its evaluation.

Foundation type. Whether firms are single site firms or subsidiaries of larger firms, whether they are private or public firms or foreign-owned might affect their decisions. For instance, relocation can be the outcome of mergers, acquisitions or take overs (Brouwer et al., 2004), implying that the foundation type is significant for the importance or even the evaluation of location factors.

Technology type of firms and sector. There is evidence that high-tech firms are more dependent on proximity to other high-tech firms, universities and public research institutes, and on human capital. Indeed, they prefer locations near universities and research institutes (Jaffe et al., 1993; Beise and Stahl, 1999; Frenkel, 2001). Thus, whether a firm is in the high-tech sector should affect the importance of location factors.

Relocation experience. Firms with former re-location experience might be less

willing to relocate if there former experience was less than pleasant, or, alternatively, more willing to relocate if doing so previously turned out to be advantageous (Arauzo-Carod et al., 2010). Thus, former relocation experience might have a significant impact on the importance of location factors.

Entrepreneur's preferences and abilities. *Firm size*, *firm age* or *sector membership* are often used as proxies for the unobserved preferences and abilities of entrepreneurs (e.g. Brouwer et al., 2004) and thus these features should influence the importance or evaluation of location factors.

Learning. There are several types of learning, including spatial and dynamic. In regard to the former, multinationals learn from the location decisions of member entities, giving them, in a sense, vicarious relocation experience, and possibly making them more willing to branch farther afield (Crozet et al., 2004). Dynamic learning is related to firm age and also has consequences for location decisions (see above at *Firm age*). The consequences of different learning types on evaluation and importance of location factors are not clear.

Concerning external factors, we hypothesize:

External factors[8]

Local education. Local human capital endowment is a determinant of location decisions and productivity (Frenkel, 2001; Moretti, 2004) and is, thus, expected to also affect the importance of other location factors. Below we use the student to employment ratio as an external factor and additional educational investment as a location factor because the latter depends on specific short- and medium-term decisions whereas the first is relatively stable across time. We expect that the student to employment ratio affects the evaluation of location factors as it may serve as an indicator of a location's social context.

Regional policies. Cohesion policy might be also important (Basile et al., 2008). Regional grants might also have an effect but only if there are industry localization effects (Devreux et al., 2007). With respect to taxes, in a meta-study, Feld and Heckemeyer (2011) find a positive median semi-elasticity of taxes on FDI (see also de Mooij and Ederveen, 2003). Accordingly, we expect that certain types of regional policy will be important location factors as well as influencing the evaluation of other location factors.

[8]External factors are important to other types of firm decisions and to firm performance variables. For instance, several studies on location factors in East-Germany find that production conditions are the most important factor in the decision by West-German firms and foreign firms to invest in East-Germany (e.g. Grundig et al., 2008).

Agglomeration economies. Several kinds of agglomeration economies (Krugman, 1991) could be important for location decisions such as urbanization economies (Barrios et al., 2006) or localization economies (Guimarães et al., 2004)[9]. The latter also affect spillover effects (Alcácer and Chung, 2007; Crozet et al., 2004; Jofre-Monseny et al., 2011)[10]. A specific kind of localization economies is measured by the density of other firms from the same home region (Buch et al., 2005). Density can also measure cultural distance, in other words, density of other home-region firms may decrease a firm's information needs or indicate existing network effects. Population density, employment density, and localization of the same sector are commonly used as proxies for agglomeration economies (Brown et al., 2009). We conclude that agglomeration economies is an important external factor. However, the findings from the large body of literature on agglomeration economies that distinguishes between urbanization and localization effects are far from being non-ambiguous. It is not easy to fully control for each type of agglomeration economy as discussed by Beaudry and Schiffauerova (2009) and Combes et al. (2011). To avoid some of the endogeneity issues, we simply control for agglomeration effects by considering the settlement type of a region and for localization economies by considering the diversity of infrastructure (Combes et al., 2004).

Market size. Market size, expressed as market potential, is important for location decisions (Brown et al., 2009; Head and Mayer, 2004). There is evidence that firms relocate more often when they serve relatively large markets (Brouwer et al., 2004). Population density or local GDP can be used as a proxy for market size. The larger the local market size the more attractive is the region (Krugman, 1991; Buch et al., 2005). But the additional attraction effect of an increase in market size declines with size (evidence found in Bade and Nerlinger (2000) for West Germany). Hence, market access is considered to be an external factor and is expected to affect the evaluation of other location factors, too. Below, we use the settlement type and travel time to a central place as controls for market size and market potential.

Infrastructure. There is evidence that communication and transport infrastruc-

[9]Agglomeration economies are also important for innovation and productivity. For instance, agglomeration effects are a more important driver of business innovation in south east England than are local connections among firms (local knowledge spillover) according to Gordon and McCann (2005). Martin et al. (2011) find evidence that plant-level productivity is higher in France when there are localization economies but that urbanization economies are insignificant.

[10]Spillovers among plants in neighboring sectors are higher than among firms of less related sectors, but these effects decline with geographic distance (Moretti, 2004)

ture is also important for a firm's location decision (Frenkel, 2001). But this has not been confirmed by all studies. Nonetheless, we control for effects of transport infrastructure on the importance and evaluation of other location factors by controlling for travel time to the next central place.

3 Empirical Approach

In the first part of the empirical analysis, we seek to explain firms' assessment of location factor quality according to Hypothesis 1 with both firm- and regional-level characteristics. To this end, the importance of a location factor to the firm and also the firm's profit assessment are included as right-hand-side variables. In the first part, we ignore the issue of the potential endogeneity of importance and profits in explaining location quality assessment and, for ease of comparability, the cross-sectional regression model is estimated using OLS. The categorical explanatory variables, sometimes also called effects in an ANOVA framework, are included as fixed effects and are thus represented by dummy variables. F-tests are employed to test the significance of categorical variables. Furthermore, in order to assess the explanatory power of a categorical variable, its partial R-square is reported, which describes the reduction of the model's R-square when the respective categorical variable is removed from the model.

In a second step, potential endogeneity is addressed by formulating and estimating a model that consists of three equations describing: (1) location factor assessment, (2) location factor importance, and (3) profit assessment.

For each location factor LF^k, $k = 1, \ldots, 15$, we specify and estimate the three equations as

$$\begin{aligned}
\textit{Quality } LF_i^k &= f(\textit{LF very important}_i^k, \textit{company's profit}_i, \textit{internal factors}_i, \\
&\quad \textit{external factors}_j) + \varepsilon_i^k \\
\textit{LF very important}_i^k &= f(\textit{company's profit}_i, \textit{internal factors}_i, \textit{external factors}_j, \\
&\quad \textit{instruments}_{1i}^k) + \omega_i^k \\
\textit{company's profit}_i &= f(\textit{internal factors}_i, \textit{external factors}_j, \textit{instruments}_{2i}) + \nu_i,
\end{aligned}$$

for firm $i = 1, \ldots, N$, where ε_i^k, ω_i^k and ν_i denote the residuals of equations. Residuals are allowed to be correlated across equation m and l, with correlation ρ_{ml}. External factors are mainly regional characteristics of district (Kreis) j, $j = 1, \ldots, J$. The dependent variable $\textit{LF very important}_i^k$ denotes whether the location factor k was

assessed as very important by firm i. The dependent variable of the third equation is *company's profit*$_i$, which is the firm's assessment of its profit situation measured on a Likert scale from 1 to 5. Given the nature of the dependent variables—that is, very important is binary whereas the two other are approximated to be continuous—we formulated a conditional mixed processes system.[11] Furthermore, since this is a recursive equation system we can employ David Roodman's CMP procedure in the second-step estimations (Roodman, 2011). The method has the advantage of allowing for mixed processes; it permits different types of dependent variables in the system (binary, censored, interval and continuous variables). CMP is technically an SUR (seemingly unrelated regressions) estimator. It treats the equations as related to each other only in having errors that are jointly normally distributed (Roodman, 2014). Thus, mathematically CMP is a full-information maximum likelihood (FIML) estimator, and all estimated parameters are structural. It also allows parameters to be fixed or random, and it does not exclude missing values listwise but conditions on each available observation. Thus, the number of observations used in the multi-equation system appears to be higher compared to the ANOVA results.[12]

The instruments specified are the sum of LFs considered *very important* by firm i ($\sum_{p \neq k}$ *LF*$_i^p$ *very important*, separately computed for hard and soft LFs)[13], the lagged profit assessments for 2002 and 2003, and the firm's assessment of its liquidity situation.

3.1 Database and Some Descriptive Statistics

The survey was conducted by the German Institute for Economic Research Berlin (DIW Berlin) on behalf of the Ministry of Education and Science in the autumn of 2004. It was sent out to about 29,000 companies[14] active in manufacturing and selected production related services such as computer and related activities, research and development, business consultants, advertising agencies, engineering services, and the like. The questionnaire was addressed to the company's general manager.

[11] It would have been possible within the CMP framework to estimate the first equation using the untransformed LF assessments as ordinal and also profit as an ordinal dependent variable. However, this leads to more convergence problems compared to specifying systems with continuous dependent variables. Moreover, as is described in Section 3.1, the variable LF assessment has been transformed by subtracting the average LF assessment for each firm. Kernel density plots show that the transformed variable is symmetrically distributed without skewness and kurtosis similar to normal density.

[12] Another advantage of this estimation method is that it facilitates the incorporation of generalizations of switching, selection, and other models in which the number and types of equations vary by observation.

[13] This is a jacknife type instrument.

[14] As mentioned above, company is different from establishment (or plant).

The manager was asked to provide information only about the company addressed, even if the company belongs to a group of companies or a conglomerate. The survey provides information on the type of company (such as size, age, type of foundation), innovation activity (R&D activity, patents, innovativeness of products), collaborative behavior, market orientation and position of the company, financial situation, investment, and relocation during the last two years.[15] In order to obtain information on the extent of local disadvantages or advantages, the companies were also asked what location factors (LFs) are important for them and how they assess the conditions at their site.[16] The assessment of the importance of a location factor is measured on a Likert scale comprising three items (very important, less important, and unimportant), the assessment of the current situation by five items (5 = very good, 4 = good, 3 = satisfactory, 2 = bad, and 1 = very bad). The following 15 location factors were selected as a priori relevant for companies:

- LF1: Proximity[17] to customers
- LF2: Proximity to suppliers
- LF3: Supply of qualified labor
- LF4: Supply of training and qualification facilities
- LF5: Supra regional accessibility by traffic
- LF6: Local traffic conditions
- LF7: Proximity to universities
- LF8: Proximity to research institutes
- LF9: Performance of local banks
- LF10: Performance of local labor office
- LF11: Performance of local authorities
- LF12: Performance of local promotion agencies
- LF13: Support by the Länder government

[15]The entire questionnaire is available from the authors upon request.

[16]The exact questionnaire wording is: "How important are the following factors for your company. How do you assess the situation at your location?" (In German: "Wie wichtig sind die folgenden Faktoren für Ihr Unternehmen? Wie beurteilen Sie die Situation an Ihrem Standort?")

[17]The terms "proximity", "supply", "performance", and "region" are not further defined and, thus, the answers by the interviewees reflect their opinion of the local situation.

- LF14: Support by the chamber of commerce
- LF15: Image of the region

About 6,000 companies responded, giving a response rate of about 20%. Around 4,900 of these companies (with nearly 146,000 employees in late 2003) are active in the manufacturing sector (3,100 industrial companies and 1,800 craftsmanships); 1,300 companies (with almost 18,000 employees) belong to the service sector. The extent to which the results of the survey reflect the total population of companies can be only roughly estimated on the basis of a comparison with the sectoral structure of the manufacturing sector. Statistics on the number of employees subject to social insurance contributions for the manufacturing sector are approximately the same as that found in the survey. Thus, the DIW survey can be considered as representative. For the service sector, no structural comparison is possible because of insufficient differentiation of comparative data (see Eickelpasch and Pfeiffer, 2006).

Due to missing information for some of the variables involved, only about 3,400 companies can be used in the analysis. Two-thirds of the sample comprise companies from the manufacturing sector; the rest are mainly business service companies (Table 1). Due to the large portion of craft shops in manufacturing, it is mostly small companies that are captured by the survey: nearly half the companies employ up to 10 employees (Table 1). A second reason for the dominance of small companies in the sample is that most companies (71%) were founded after German reunification and 12% were founded in 2001 or later. The companies included in the sample are located in East German agglomerations as well as in less densely populated and rural areas (see Table 2).

The importance of the different location attributes is measured as the share of companies that regard the respective location attribute as "very important". Accordingly, the most important location attribute among the ones investigated here is the availability of skilled employees; 72% of the companies rate this attribute as "very important" (Table 9). On average, the mean assessment of this factor is 2.9. Large companies are more content with the supply of qualified labor than are small companies, and foreign-controlled companies more satisfied than independent East German companies.

Overall, the location factors can be sorted into two groups: those we label "hard" factors (LFs 1–8) that involve conditions essential for business operations (e.g., closeness to customers or suppliers, transportation, qualified labor), and those we can label as "soft" factors (LFs 9–15), which are not of crucial importance for the business, such as performance of public administration, business promotion agencies,

or regional "image". Table 3 shows that, on average, firms give "hard" factors a better score than they give the "soft" factors. This could mean that companies are more content with those location conditions that are important for their business operation, whereas the poorer rating of soft factors might signal a certain degree of discontent on the part of the survey respondent with the firm's location.

Proximity to customers is a very important location factor for 64% of the companies. This is the second highest assessment received by any factor. However, for larger manufacturing companies oriented to national and international markets, the local market is less important than it is to service companies and craft business.

There is a group of location factors that is less important than proximity to customers and yet still very important for about half the companies. These factors include the performance of banks (56% of companies), the image of the region (55%), the local traffic conditions (52%), and supra-regional accessibility (48%). The firms' evaluation of these criteria varies widely: the performance of local financial institutes is rated worst, whereas traffic conditions reached the highest ranks among all location factors.

The following location conditions are classified as very important less frequently: supply of training and qualification facilities (45%) and support by local authorities such as chambers of commerce, state-level administration, labor agencies, business promotion agencies, etc. (between 30–40%). All types of local authorities are assessed as poor by most of the companies, as indicated by the below-average mean score.

Proximity to research institutes and to universities is important for only a minority of the companies surveyed (17% and 13%, respectively). This is not astonishing as only a few of the companies were conducting research and development. Overall, the assessments with regard to the regional research infrastructure are relatively good and reflect the good supply of research facilities in East Germany.

4 Econometric Results

The first and most striking finding from our regression analyses (reported in Tables 6 to 11) is the overwhelming heterogeneity in firms' perceptions of the quality of LFs, which cannot be explained by either firm-specific or regional-specific characteristics.[18] Note that a number of additional factors were tested but, due to their

[18]The results of probit estimations for explaining location factor importance are not reported but available from the authors upon request. They are similar in that, in general, it is difficult to predict whether a location factor will be viewed as important to a firm based on knowing the firm's characteristics. The only models that provide reasonable pseudo-R^2s (about 0.24 and

insignificance, are not reported in the estimation tables. Thus, one major finding of our study is that there is not a single explanatory factor that can explain perceptions of location conditions across firms. Given that perception should reflect the local condition to some extent, this is quite surprising. Furthermore, we find that the R^2s of the various models reveal that a great deal of the variation across firms remains unexplained despite the large number of explanatory factors included. Or, to put it differently, considering our controls for firm and region characteristics, we are not able to predict firms' perception of location quality. Thus, Hypothesis 1 is not supported by the results. As a robustness check, we replace district-level explanatory variables with district-level fixed effects, which accounts for all unobserved heterogeneity at the district level; the results are reported in Table 10. In some cases, model R^2 increases as a consequence of this generalization, but in terms of partial R^2 we find considerable district-level effects only for transportation infrastructure and proximity to universities and research. This supports the notion that location quality evaluation is not influenced by unobserved district-level heterogeneity, which also implies that that there is a great deal of within-district variation in firm evaluations.

Second, the study finds evidence that for a number of LFs, quality perception and the assessment of whether the respective LF is very important for the firm are related, hence supporting Hypothesis 2. However, we find that the direction of this effect is in some cases negative, but in the majority of cases positive, meaning that firms that assess a specific factor as being important are inclined to rate the location condition higher than do firms that do not assess this factor as important. This finding holds in particular for closeness to customers, proximity to universities and research institutions, performance of business promotion agencies and support by the Länder government. As discussed previously, this positive effect might stem from the fact that firms put more effort into evaluating a location condition when that condition is important for the firm. Hence, in these cases, firms for which a certain factor is important have a tendency to rate that factor better. On the other hand, for the LF supply of qualified labor, the results show that firms stating that this LF is important to them give it, on average, a worse rating. One explanation for this could be that firms experience problems in recruiting staff and therefore rate this factor as important but below average.

To address the potential dependency between importance and assessment, we

0.20, respectively) are those for closeness to customers and proximity to universities and research institutions. In the former case, it is share of local sales that is a good predictor of importance, whereas in the second and third cases, it is the firm's innovation activity that is a good predictor. For most other models, pseudo-R^2s are around 0.05.

estimate the three-equation model described in Section 3. The results for the coefficients of endogenous variables and the cross-equation error correlations are reported in Table 11. Overall, these models confirm previously discovered relationships between importance and assessment. However, taking into account endogeneity, results for importance change for a number of LFs. For the first two factors—closeness to customers and suppliers—the effect of importance becomes stronger in the multi-equation model. On the other hand, for the LF supply of qualified labor, the negative and significant coefficient for importance is no longer significant in the multi-equation model. Also, the strong and positive effects from closeness to universities and research institutions become weaker. In the multi-equation models we also find strong negative significance of importance for the LFs performance of local banks and support by the Länder government. In the multi-equation model, the effects for importance range from 0.172 (closeness to customers) to -0.097 (performance of local banks). This means that, overall, the effects, considering that 1 is a full grade in the assessment, are rather small. Thus, despite being statistically significant, the average impact from being very important to the firm on its rating is not very large.

Table 11 reveals evidence of significant residual correlations between equations, meaning that the estimations are also more efficient compared to equation-by-equations estimations.

Regarding our third hypothesis, the empirical evidence shows that a firm's profit situation, assessed on a Likert scale ranging from 1 = high losses to 5 = high profit, is quite a good predictor of a firm's perception of location quality. The effect is particularly high for performance of local banks, where a better profit situation is accompanied by a better assessment. The effect is also positive and significant for closeness to customers. Thus, firms with higher profits assess this location condition better. On the other hand, we find the strongest negative impact on profit is from supply of qualified labor, meaning that firms that have higher profits give this LF a worse rating. This could mean that it is the relatively high-profit firms, in particular, that perceive this factor as a limitation, whereas firms that do not have high profits do not, on average, perceive recruitment problems. The impact of profit situation on importance is often opposite from its impact on quality ratings. For instance, for location factors closeness to customers and performance of local banks we find that firms with higher profits tend to answer that those factors are not important to them. In contrast, when it comes to the supply of qualified labor, firms with higher profits typically tend to answer that this factor is important to them.

Firms with higher profit tend to rate the transport infrastructure worse. Again, one explanation for this finding is that businesses that develop positively are more

likely to experience some limitations regarding this location factor. For instance, when a firm starts to export, it becomes more dependent on supra-regional transportation links.

Finally, regarding single explanatory firm- and regional-specific factors for both importance and assessment, note that the effect of a categorical variable can be expressed as partial R^2, which denotes the reduction in the model's R^2 when the respective effect is removed. Among the group of categorical explanatory factors, we find that neither settlement type of the district where the firm is located, nor the firm's industry classification, are important variables in explaining firms' assessments. The few cases where settlement type is related to assessment involve educational qualification, transport infrastructure, and proximity of university and research institutions. These factors are unevenly distributed across the various regions and, furthermore, are strongly related to settlement type, which is a categorization of regions according to population density. Industry classification is significant for the ratings of proximity to research institutes and supply of training and qualification facilities. In both cases, the rating might be related to the firm being active in a knowledge-intensive industry. One effect that has a surprisingly high explanatory power for many LFs is the federal state. It is not fully clear why, in a number of cases, the ratings are more related to the administrative federal state in which the firm is located, rather than being related to the settlement type, which is more of a regional characteristic. It is also worth noting that a firm's innovation activity has some explanatory power regarding the ratings. Overall, however, there are only a few cases when the partial R^2 of a categorical effect is higher than 0.01, showing that the effect of those variables on the dependent variable (location quality assessment) is minor.

For the group of continuous regressors, the share of local sales (i.e., sales within a radius of 30km from the location) has some explanatory power for a number of LFs, in particular for closeness to customers and suppliers. However, it has a negative relationship with assessment of proximity to universities and research institutions, which means that firms with a higher local sales share rate those LFs worse. Moreover, those firms that are locally more embedded have a tendency to rate the image of the region worse. Similarly, they also rate traffic conditions, both supra- and intra-regional, worse. Regarding characteristics that are related to the region, the travel distance in minutes to the nearest regional center and diversification, which describes the diversity of industry structure in the district, are worth mentioning. It is not surprising that firms with longer travel times to the nearest central place rate the transport infrastructure quality worse. Diversity, defined as in Combes et

al. (2004), measures the presence of a high number of branches in the respective district and is positively related to assessments of transport infrastructure and to proximity to universities and research institutes, but negatively to a number of soft factors, such as performance of local banks and support by the Länder government. For example, the diversity measure is highest in East Berlin, where universities and research institutions are located and also where transport conditions are on average better, but, at the same time, firms do not rate as high the quality of support by the federal state government or the performance of local financial institutions.

It is noteworthy that the results regarding the effect of importance and profit on the location assessment are robust with regard to the estimation approach. That is, when specifying instruments in the equation system and accounting for potential endogeneity between importance, profits, and quality perception, most effects are confirmed.[19]

5 Conclusions

Following German reunification, a great deal of effort was put into improving the infrastructure and location conditions of East German regions. The most visible improvements are in areas of transportation infrastructure and in expansion and foundation of universities and research institutes. However, even though some East German regions experienced remarkably positive development, other regions continue to lag.

The focus of this study is firms' evaluation of location quality. Based on survey data, we find that, on average, East German firms rated "hard" location factors, that is, factors that have relatively direct links to a firm's business operations, better than "soft factors", which are location attributes related more to public administration, various types of governmental and non-governmental support, and the region's "image". Thus, the aforementioned infrastructure improvements in East Germany are partly reflected in the firms' evaluation of "hard" location factors. However, somewhat surprisingly, supply of skilled workers (72%) and closeness to customers (65%) are the most cited very important location factors for firms, whereas transport infrastructure (50%) and proximity to universities and research institutes (15%) are mentioned less frequently as being very important.

The econometric analyses explaining firms' evaluations with firm characteristics, that is, *internal factors* such as size, age, export, innovation activity, or industry, re-

[19] In the CMP framework, no tests of instrument validity are possible. However, it is possible to determine whether the instruments are significant and accordingly the exclusion restriction holds, and this did, indeed, turn out to be the case.

veal that these variables have limited explanatory power. Similarly, *external factors*, which are regional characteristics, such as settlement type (i.e., rural vs. urbanized or agglomerated regions), industry diversity, regional accessibility, and other location attributes, also have limited power in explaining a firm's location factor evaluation. On the other hand, when a specific location factor is being considered as very important but also the firm's current profit assessment are significantly related to the firm's location quality rating. Whether these effects, which even hold when controlling for potential endogeneity, are revealing a "perception bias" in a firm's location evaluation is a question beyond the scope of this study.

Our findings contain some interesting insights for regional location policies intended to keep existing firms at their current location or attract new ones. First, the results show that a firm's perception of location conditions may not necessarily reflect the "true" conditions. However, it could very well be that perceptions are more important than "truth" when it comes to a firm's location decision. Hence, firms' quality perceptions should be considered as highly relevant in location development policies. Second, the limited explanatory power of a firm's internal characteristics for its evaluation of location factor quality shows that apparently each firm has unique location condition requirements or preferences. Thus, a "one-size-fits-all" location policy is unlikely to be successful.

References

Adams, J.D., Jaffe, A.B. (1996), Bounding the effects of R&D: An investigation using matched establishment-firm data, Rand Journal of Economics **27**: 700–721.

Alcácer, J., Chung, W. (2007), Location strategies and knowledge spillovers, Management Science **53**: 760–776.

Arauzo-Carod, J.-M., Liviano-Solid, D., Manjón-Antolín, M. (2010), Empirical studies in industrial location: An assessment of their methods and results, Journal of Regional Science **50**: 685–711.

Arauzo, J. M., Manjón, M., (2004), Firm size and geographical aggregation: An empirical appraisal in industrial location, Small Business Economics **22**: 299-–312.

Audretsch, D.B., Falck, O., Feldman, M.P., Heblich, S. (2012), Local entrepreneurship in context, Regional Studies **46**: 379–389.

Bade, F.-J., Nerlinger E. A. (2000), The spatial distribution of new technology-based firms: Empirical results for West-Germany, Papers in Regional Science **79**: 155-176.

Baldwin, J.R., Brown, W.M., Rigby, D.L. (2010), Agglomeration economies: microdata panel estimates from Canadian manufacturing, Journal of Regional Science **50**: 915–934.

Barrios, S., Gorg, H., Strobl, E. (2006), Multinationals' location choice, agglomeration economies and public incentives, International Regional Science Review **29**: 81–107.

Basile, R., Castellani, D., Zanfei, A. (2008), Location choice of multinational firms in Europe: Empirical results for West-Germany, Papers in Regional Science **79**: 155–176.

Bathelt, H., Glückler, J. (2011), *The relational economy: geographies of knowing and learning*, Oxford University Press.

Beaudry, C., Schiffauerova, A., (2009), Who's right, Marshall or Jacobs? The localization versus urbanization debate, Reserach Policy, **38**: 318–337.

Beise, M., Stahl, H. (1999), Public research and industrial innovations in Germany, Research Policy **28**: 397–422.

Brouwer, A.E., Mariotti, I., van Ommeren, J.N. (2004), The firm relocation decision: An empirical investigation, Annals of Regional Science **38**: 335–347.

Brown, J.P., Florax, R.J.G.M., McNamara, K.T. (2009), Determinants of investment flors in U.S. manufacturing, Review of Regional Studies **39**: 269–286.

Buch, C., Kleinert, J., Lipponer, A., Toubal, F. (2005), Determinants and effects of foreign direct investment: Evidence from German firm-level data, Economic Policy **41**: 51–110.

Chen, M.X., Moore, M.O. (2010), Location decision of heterogeneous multinational firms, Journal of International Economics **80**: 188–199.

Combes, P.-P., Duranton, G., Gobillon, L. (2011), The identification of agglomeration economies, Journal of Economic Geography **11**: 253-266.

Combes, P.-P., Magnac, T., Robin, J.-M. (2004), The dynamics of local employment in France, Journal of Urban Economics **56**: 217-243.

Crozet, M., Mayer, T., Mucchielli, J.-L. (2004), How do firms agglomerate? A study of FDI in France, Regional Science and Urban Economics **34**: 27–54.

Cyert, R.M., March, J.G., (1963). *A behavioral theory of the firm*, Prentice Hall.

Czarnitzki, D., Hottenrott, H. (2009), Are local milieus the key to innovation performance, Journal of Regional Science **49**: 81–112.

De Mooij, R.A. and Ederveen, S. (2003), Taxation and foreign direct investment: A synthesis of empirical research, International Tax and Public Finance **10**: 673-–693.

Devreux, M.P., Griffith, R., Simpson, H. (2007), Firm location decisions, regional grants and agglomeration externalities, Journal of Public Economics **91**: 41–435.

Eickelpasch, A., Pfeiffer, I. (2006), Unternehmen in Ostdeutschland - wirtschaftlicher Erfolg mit Innovationen. Wochenbericht des DIW 73(14): 173 - 180.

Feld, L.P., Heckemeyer, J.H. (2011), FDI and taxation: A meta-study, Journal of Economic Surveys **25**: 233–272.

Fischer, G., Wahse, J., Dahms, V., Frei, M., Riedmann, A., Janik, F. (2007), *Standortbedingungen und Beschäftigung in den Regionen West- und Ostdeutschlands: Ergebnisse des IAB-Betriebspanels 2006*, IAB-Forschungsbericht, No. 2007, 5.

Frenkel, A. (2001), Why high-technology firms choose to locate in or near metropolitan ares, Urban Studies **38**:1083–1101.

Gordon, I.R., McCann P. (2005), Innovation, agglomeration and regional development, Journal of Economic Geography **5**: 523–543.

Grabow, B., Henckel, D. et al. (1995), *Weiche Standortfaktoren*: Schriftenreihe des Deutschen Instituts für Urbanistik 89.

Grundig, B., Pohl, C., Schmalholz, H. (2008), Ostdeutschland im internationalen Standortvergleich, ifo berichtet **1/2008**: 33–40.

Guimarães, P., Figuiredo, O., Woodward, D. (2004), Industrial location modelling: Extending the random utility framework, Journal of Regional Science **44**: 1–20.

Haltiwanger, J.C., Lane, J.I., Spletzer, J.R. (1999), Productivity differences across employers: the roles of employer size, age and human capital, American Economic Review: Papers and Proceedings **53**: 1–28.

Hayter, R. (1997), *The dynamics of industrial location*, Wiley.

Head, K., Mayer, T. (2004), Market potential and the location of Japanes investment in the European Union, The Review of Economics and Statistics **86**: 959–972.

Helpman, E., Melitz, M., Yeaple, S. (2004), Export versus FDI with heterogeneous firms, American Economic Review **94**: 605–627.

Henderson, V. (2003), Marshall's scale economies, Journal of Urban Economics **89**: 94–98.

Hodgson, G. (1988), *Economic institutions: A manifesto for a modern institutional economics.* Polity Press.

Hoogstra, G.J., van Dijk, J. (2004), Explaining firm employment growth: Does location matter?, Small Business Economics **22**: 179–192.

Jaffe, A., Trajtenberg, M., Henderson, R., (1993), Geographic localization of knowledge spillovers as evidenced by patent citations. Quarterly Journal of Economics **108**: 577–598.

Jofre-Monseny, J., Marín-López, R., Viladecans-Marsal, E. (2011), The mechanisms of agglomeration: Evidence from the effect of inter-industry relations on the location of new firms, Journal of Urban Economics **70**: 61–74.

Krugman, P. (1991), Increasing returns and economic geography, Journal of Political Economy **99**: 483–499.

Lejpras, A., Eickelpasch, A., Stephan, A. (2011), Locational and internal sources of firms competitive advantage: Applying Porter's diamond model at the firm level, Journal of Strategic Management Education **7**: 1–26.

Lejpras, A., Stephan, A. (2011), Locational conditions, cooperation, and innovativeness: Evidence from research and company spin-offs. Annals of Regional Science **46**: 543–575.

Lundvall, B.-A., Johnson, B. (1994), The learning economy, Journal of Industry Studies **1**: 23–42.

Martin, P., Mayer, T., Mayneris, F. (2011), Spatial concentration and plant-level productivity in France, Journal of Urban Economics **69**: 182–195.

Maskell, P., Eskelinen, H., Hannibalsson, I., Malmberg, A., Vatne, E. (1998), *Competitiveness, localised learning and regional development – specialisation and prosperity in small open economies*, Routledge.

Mayer, T., Mejean, I., Nefussi, B. (2010), The location of domestic and foreign production affiliates by French multinational firms, Journal of Urban Economics **68**: 115–128.

McDermott, P.J., Taylor M.J. (1996), Attitudes, images, and location: The subjective context of decision making in New Zealand Manufacturing, Economic Geography **52**: 325–347.

Meesters, W.J: (2004), *Locational Preferences of Entrepreneurs. Stated Preferences in the Netherlands and Germany* (Contributions to Economics) Springer, 2004.

Moretti, E., (2004), Workers' education, spillovers, and productivity: Evidence from plant-level production functions, American Economic Review **94**: 656–690.

Nelson, R.R., Winter, S.G. (1982), *An evolutionary theory of the firm*, Belknap Press.

Powell, W. (1990), Neither market nor hierarchy: Network forms of organizations, Research in Organizational Behaviour **12**: 295–336.

Pred, A. (1967), *Behaviour and location, Part I* Lund studies in Geography, Series B, No. 27, Royal University of Lund.

Rigby, D.L., Essletzbichler, J. (2002), Agglomeration economies and productivity differences in US cities, Journal of Economic Geography **2**: 407–432.

Roodman, D. (2011), Estimating fully observed recursive mixed-process models with cmp. Stata Journal **11**: 159-206.

Roodman, D. (2014), CMP: Stata module to implement conditional (recursive) mixed process estimator. Statistical software components, URL https://ideas.repec.org/c/boc/bocode/s456882.html

Stephan, A. (2011), Locational conditions and firm performance: introduction to the special issue, Annals of Regional Science, **46**: 487-494.

Stephan, A. (2014), Are public research spin-offs more innovative? Small Business Economics **43**: 353–368.

Strange, W., Hejyzi, W., Tang, J. (2006), The uncertain city: Competitive instability, skills, innovation and the strategy of agglomeration, Journal of Urban Economics **59**: 331–351.

Taylor, M., Asheim, B. (2001), The concept of the firm in economic geography, Economic Geography **77**: 315–328.

van Dijk, J., Pellenbarg, P.H. (2000), Firm relocation decisions in The Netherlands: An ordered logit approach, Papers in Regional Science **79**: 191–219.

Zukin, S., DiMaggio, P. (eds.) (1990), *Structures of capital: The organization of the economy*, Cambridge University Press.

Table 1: Distribution of firms' characteristics (n=3,404)

Panel A: Employees, size classes	**Obs**	**Percent**
≤10	1,710	50.2
10-20	693	20.4
21-50	625	18.4
51-100	207	6.1
101-250	145	4.3
>250	24	0.7
		100
Panel B: Establishment year		
≤1990	1,009	29.6
1991-1995	1,178	34.6
1996-2000	838	24.6
2001-2004	379	11.1
		100
Panel C: Business type		
Industry	1,200	35.3
Craftsmanship	945	27.8
Services	1,108	32.6
Other	151	4.4
		100
Panel D: Foundation type		
University spin-off	55	1.4
Research spin-off	39	1.0
Company spin-off	975	24.9
Other foundation type	2,853	72.7
		100
Panel E: Federal state		
Berlin	434	12.75
Brandenburg	433	12.72
Mecklenburg-Vorpommern	267	7.84
Sachsen	1,197	35.2
Sachsen-Anhalt	389	11.4
Thueringen	684	20.1
		100

Source: DIW Berlin 2004 survey, calculations by the authors

Table 2: Distribution of firms over district settlement types (n=3,404)

Settlement types	Obs	Percent
I Agglomeration areas		
1. Central cities: >100.000 inhabitants	786	23.1
2. Highly agglomerated counties: population density > 300 inhabitants/km	71	2.1
3. Agglomerated counties: population density > 150 inhabitants/km	392	11.5
4. Rural Counties: population density < 150 inhabitants/km	320	9.4
II Urbanized areas		
5. Central cities: > 100.000 inhabitants	204	6.0
6. Agglomerated Counties: population density > 150 inhabitants/km	478	14.0
7. Rural Counties: population density < 150 inhabitants/km	456	13.4
III Rural areas		
8. Rural counties with higher density: population density > 100 inhabitants/km	336	9.9
9. Rural counties with lower density: population density < 100 inhabitans/km	361	10.6

Source: DIW Berlin 2004 survey, BBR settlement type definition

Table 3: Importance and perception of location factors LF1-LF15 (n=3,797)

Location factor	Very important (%)	Quality[1]	Std.dev.
Hard location factors			
LF1: Closeness to customers	64.8	3.57	0.85
LF2: Closeness to suppliers	30.8	3.51	0.77
LF3: Supply of skilled workers	72.2	2.87	0.98
LF4: Additional education supply	44.9	3.23	0.81
LF5: Supra-regional transportation links	47.9	3.30	1.00
LF6: Intra-regional transportation links	52.1	3.32	0.94
LF7: Proximity to universities	16.6	3.52	0.91
LF8: Proximity to research institutions	12.5	3.33	0.92
Soft location factors			
LF9: Support of local financial institutions	56.4	2.74	1.06
LF10: Support of job centers	29.9	2.70	0.96
LF11: Support of local public administration	36.0	2.76	0.94
LF12: Support of local business development agencies	38.2	2.77	0.95
LF13: Chambers' support	39.4	2.56	0.99
LF14: State government promotion	40.0	2.75	0.99
LF15: Image of the region	54.6	3.08	0.91

Source: DIW Berlin 2004 survey, calculations by the authors

[1] measured on a scale 1-5, 1=very poor, 3=satisfactory, 5=very good

Table 4: Correlations between location factor quality evaluations (n=3,114)

	LF1	LF2	LF3	LF4	LF5	LF6	LF7	LF8	LF9	LF10	LF11	LF12	LF13	LF14
LF1	1.00													
LF2	0.48	1.00												
LF3	0.14	0.16	1.00											
LF4	0.13	0.17	0.45	1.00										
LF5	0.20	0.17	0.17	0.21	1.00									
LF6	0.18	0.18	0.16	0.21	0.72	1.00								
LF7	0.11	0.13	0.18	0.28	0.31	0.30	1.00							
LF8	0.10	0.13	0.18	0.28	0.29	0.27	0.82	1.00						
LF9	0.15	0.14	0.14	0.17	0.09	0.10	0.07	0.09	1.00					
LF10	0.11	0.10	0.26	0.22	0.13	0.13	0.13	0.13	0.34	1.00				
LF11	0.14	0.12	0.21	0.21	0.14	0.15	0.12	0.13	0.33	0.55	1.00			
LF12	0.09	0.09	0.15	0.23	0.15	0.14	0.18	0.19	0.31	0.40	0.49	1.00		
LF13	0.07	0.07	0.19	0.20	0.12	0.11	0.16	0.18	0.31	0.38	0.48	0.60	1.00	
LF14	0.11	0.10	0.17	0.27	0.12	0.13	0.15	0.15	0.29	0.37	0.41	0.48	0.54	1.00
LF15	0.20	0.15	0.21	0.22	0.23	0.22	0.23	0.24	0.21	0.23	0.30	0.28	0.31	0.32

Source: DIW Berlin 2004 survey, calculations by the authors

Notes: LF1=Proximity to suppliers, LF2=Proximity to clients, LF3=Supply of qualified labor, LF4=Supply of training and qualification facilities, LF5=Supra regional accessibility by traffic, LF6=Local traffic conditions, LF7=Proximity to universities, LF8=Proximity to research institutes, LF9=Performance of local banks, LF10=Performance of local labour office, LF11=Performance of local authorities, LF12=Performance of local promotion agencies, LF13=Support by the Länder government, LF14=Support by the chambers of commerce, LF15=Image of the region
All LFs are defined as difference of LF score to the firm's average assessment score over all LFs.

Table 5: Summary statistics of continuous regressors (n=3,404)

Variable	mean	stddev	min	max
Firm characteristics				
Company's profit (scale 1-5, 1=very poor, 5=very good)	3.38	1.16	1	5
Local sales share (%)	43.15	38.22	0	100
Export sales share (%)	6.46	16.28	0	100
Share empl university degree (%)	20.75	28.11	0	100
Location characteristics				
Travel distance to nearest central place (in minutes)	26.01	21.94	0	77
District unemployment rate (%)	19.10	3.17	12	31.5
Students rate per 1000 employees, district	20.19	29.79	0	203.2
log branch diversification (Combes et al 2004), district	0.39	0.91	-0.94	2.52

Source: DIW Berlin 2004 survey, IAB labor market statistics, calculations by the authors

Notes: Local sales share - within 30km radius

Table 6: Regression results for perception of location factor quality LF1-LF4

DEP. VARIABLES	df	Quality LF1	Quality LF2	Quality LF3	Quality LF4
LF Very important	1	0.10444**	0.07122**	-0.25840***	0.04195
		(0.04163)	(0.03149)	(0.03120)	(0.02617)
Company's profit	1	0.05666***	-0.00456	-0.07015***	-0.04090***
		(0.01190)	(0.01213)	(0.01366)	(0.01151)
Local sales share	1	0.00421***	0.00128***	0.00017	-0.00024
		(0.00043)	(0.00040)	(0.00046)	(0.00042)
Export sales share	1	-0.00175	-0.00108	0.00111	-0.00074
		(0.00122)	(0.00116)	(0.00082)	(0.00081)
Share empl university degree	1	-0.00184***	0.00025	0.00060	0.00103*
		(0.00055)	(0.00066)	(0.00064)	(0.00059)
Travel distance to centers	1	-0.00044	0.00119	-0.00200	-0.00007
		(0.00104)	(0.00110)	(0.00120)	(0.00085)
Unemployment rate	1	0.00246	0.00659	0.00401	0.00712
		(0.00448)	(0.00540)	(0.00575)	(0.00525)
Student rate	1	-0.00058	-0.00010	-0.00119*	-0.00001
		(0.00049)	(0.00055)	(0.00065)	(0.00069)
Log diversity	1	-0.06025	-0.01125	-0.08860	0.03056
		(0.05346)	(0.05063)	(0.07762)	(0.04683)
Constant	1	-0.04668	0.50539**	0.66693**	-0.70988***
		(0.20708)	(0.22449)	(0.27426)	(0.19484)
Fixed effects categorical variables - partial R^2 reported					
Federal state	5	0.00487***	0.00281*	0.00295*	0.00228
Settlement type	8	0.00252	0.00128	0.00230	0.00741***
Business type	3	0.00241**	0.00560***	0.00153	0.00146
Size	5	0.000346	0.000365	0.00250	0.000202
Industry	37	0.0108	0.0159**	0.0158**	0.0204***
Foundation type	3	0.000768	0.00195*	0.000226	0.00153
Age	3	0.000374	0.000440	0.000955	0.00510***
Innovation activity	4	0.00383***	0.000857	0.00159	0.000961
Relocation	7	0.00396**	0.00433**	0.00507**	0.00108
Headquarter location	3	0.00165	0.000721	0.00224*	0.000187
R-squared		0.12117	0.06412	0.07275	0.05112
Observations		3,404	3,254	3,367	3,177

Robust clustered (by district) standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: LF1=Proximity to suppliers, LF2=Proximity to clients,

LF3=Supply of qualified labor, LF4=Supply of training and qualification facilities

Partial R^2 measures the effect on R^2 if the categorical variable is removed.

Table 7: Regression results for perception of location factor quality LF5-LF8

DEP. VARIABLES	df	Quality LF5	Quality LF6	Quality LF7	Quality LF8
LF Very important	1	0.05107	-0.01976	0.22239***	0.28491***
		(0.03320)	(0.02796)	(0.04167)	(0.04250)
Company's profit	1	-0.04750***	-0.04169**	-0.04366***	-0.02970**
		(0.01704)	(0.01606)	(0.01119)	(0.01424)
Local sales share	1	-0.00019	0.00048	-0.00122**	-0.00154***
		(0.00044)	(0.00042)	(0.00052)	(0.00050)
Export sales share	1	-0.00266***	-0.00117	-0.00066	-0.00063
		(0.00094)	(0.00114)	(0.00087)	(0.00088)
Share empl university degree	1	0.00048	-0.00034	0.00107*	0.00093
		(0.00060)	(0.00059)	(0.00063)	(0.00065)
Travel distance reg center	1	-0.00734***	-0.00584***	-0.00200	0.00008
		(0.00219)	(0.00159)	(0.00171)	(0.00154)
Unemployment rate	1	-0.01851*	-0.00336	0.00299	-0.00806
		(0.01089)	(0.00708)	(0.00847)	(0.00775)
Student rate	1	-0.00049	-0.00104	0.00253***	0.00196**
		(0.00115)	(0.00068)	(0.00082)	(0.00098)
Log diversity	1	0.24655**	0.16564*	0.18554**	0.23579***
		(0.12285)	(0.08833)	(0.08308)	(0.07059)
Constant	1	-0.36067	-0.47416	-0.46897	-0.43612*
		(0.51381)	(0.32816)	(0.33533)	(0.25673)
Fixed effects categorical variables - partial R^2 reported					
Federal state	5	0.0134***	0.00883***	0.00646***	0.00713***
Settlement type	8	0.00804***	0.00375	0.0215***	0.0112***
Business type	3	0.00192*	0.000872	0.00456***	0.00159
Size	5	0.00239	0.00292	0.00287*	0.00333*
Industry	37	0.00921	0.0101	0.0168**	0.0173**
Foundation type	3	0.000536	0.00104	0.00322**	0.00366***
Firm age	3	0.000741	0.000535	0.000707	0.00121
Innovation activity	4	0.00314**	0.00133	0.00289*	0.00402**
Relocation	7	0.00493**	0.00203	0.00345	0.00219
Headquarter location	3	0.00174*	0.000427	0.000737	0.000428
R-squared		0.13212	0.10425	0.18578	0.17694
Observations		3,221	3,230	2,795	2,674

Robust clustered (by district) standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: LF5=Supra regional accessibility by traffic, LF6=Local traffic conditions,

LF7=Proximity to universities, LF8=Proximity to research institutes

Partial R^2 measures the effect on R^2 if the categorical variable is removed.

Table 8: Regression results for perception of location factor quality LF9-LF12

DEP. VARIABLES	df	Quality LF9	Quality LF10	Quality LF11	Quality LF12
LF Very important	1	-0.14163***	0.07952**	-0.01083	0.18489***
		(0.03691)	(0.03158)	(0.03266)	(0.02986)
Company's profit	1	0.08835***	-0.01925*	0.00867	0.03937***
		(0.01587)	(0.01161)	(0.01244)	(0.01329)
Local sales share	1	0.00001	-0.00034	0.00002	-0.00150***
		(0.00053)	(0.00052)	(0.00047)	(0.00050)
Export sales share	1	0.00051	0.00040	0.00151*	0.00055
		(0.00131)	(0.00099)	(0.00089)	(0.00096)
Share empl university degree	1	-0.00041	-0.00069	0.00008	-0.00154***
		(0.00077)	(0.00059)	(0.00051)	(0.00056)
Travel distance reg center	1	0.00397***	0.00412***	0.00113	0.00090
		(0.00143)	(0.00116)	(0.00099)	(0.00129)
Unemployment rate	1	-0.00031	0.01434***	0.00778	0.00242
		(0.00627)	(0.00506)	(0.00482)	(0.00504)
Student rate	1	-0.00056	-0.00193***	-0.00123**	-0.00018
		(0.00068)	(0.00050)	(0.00056)	(0.00066)
Log diversity	1	-0.22512***	0.08243	-0.12318*	-0.10834*
		(0.07395)	(0.06130)	(0.06583)	(0.06226)
Constant	1	0.75815**	-0.24933	0.27196	-0.08701
		(0.31774)	(0.25428)	(0.26476)	(0.23207)
Fixed effects categorical variables - partial R^2 reported					
Federal state	5	0.00228	0.00221	0.00132	0.00113
Settlement type	8	0.00466*	0.00194	0.00248	0.00224
Business type	3	0.00493***	0.00124	0.000633	0.00212*
Size	5	0.00382**	0.00158	0.00171	0.00131
Industry	37	0.0106	0.0137	0.0140	0.0147
Foundation type	3	0.00114	0.000285	0.000772	0.00189
Firm age	3	0.00431***	0.000506	0.000548	0.000269
Innovation activity	4	0.00436***	0.00101	0.00157	0.000678
Relocation	7	0.00300	0.00347	0.00159	0.00240
Headquarter location	3	0.000208**	0.00247***	0.00327	0.000307
R-squared		0.08943	0.08799	0.09200	0.08035
Observations		3,201	3,075	3,097	2,940

Robust clustered (by district) standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: LF9=Performance of local banks, LF10=Performance of local labour office, LF11=Performance of local authorities, LF12=Performance of local promotion agencies

Partial R^2 measures the effect on R^2 if the categorical variable is removed.

Table 9: Regression results for perception of location factor quality LF13-LF15

DEP. VARIABLES	df	Quality LF13	Quality LF14	Quality LF15
LF Very important	1	0.08868**	0.30958***	0.05158
		(0.03613)	(0.02318)	(0.03259)
Company's profit	1	0.05372***	0.02287*	0.02041
		(0.01231)	(0.01271)	(0.01370)
Local sales share	1	-0.00074	-0.00011	-0.00211***
		(0.00048)	(0.00045)	(0.00039)
Export sales share	1	0.00142	0.00085	0.00093
		(0.00110)	(0.00108)	(0.00123)
Share empl university degree	1	-0.00064	-0.00093	-0.00043
		(0.00073)	(0.00066)	(0.00056)
Travel distance reg center	1	0.00111	0.00033	0.00478***
		(0.00124)	(0.00104)	(0.00127)
Unemployment rate	1	-0.00042	0.00871	-0.02708***
		(0.00581)	(0.00560)	(0.00598)
Student rate	1	-0.00032	-0.00019	0.00225**
		(0.00067)	(0.00069)	(0.00100)
Log diversity	1	-0.23954***	-0.12223**	0.08437
		(0.05829)	(0.06026)	(0.06198)
Constant	1	-0.36493	0.00656	0.48452*
		(0.27658)	(0.24302)	(0.24789)
Fixed effects categorical variables - partial R^2 reported				
Federal state	5	0.00153	0.00291*	0.0200***
Settlement type	8	0.00354	0.00426*	0.00145
Business type	3	0.00733***	0.00537***	0.00256**
Size	5	0.00698***	0.00315*	0.00324**
Industry	37	0.0130	0.0134	0.0124
Foundation type	3	0.00151	0.000533	0.00352***
Firm age	3	0.00520***	0.00202*	0.000296
Innovation activity	4	0.00331**	0.00141	0.00189
Relocation	7	0.00427*	0.00126	0.00294
Headquarter location	3	0.00224*	0.000838	0.000582
R-squared		0.13857	0.11241	0.10703
Observations		2,954	3,085	3,184

Robust clustered (by district) standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: LF13=Support by the Länder government, LF14=Support by

the chambers of commerce, LF15=Image of the region

Partial R^2 measures the effect on R^2 if the categorical variable is removed.

Table 10: ANOVA partial R^2 results for district fixed effects and firm related variables

Dep. Var. Quality:	LF1	LF2	LF3	LF4	LF5	LF6	LF7	LF8
Model SSQ	326.2	172.9	227.1	121.1	560.9	347.2	406.6	353.9
Partial R^2								
District fixed effect	0.0350	0.0451	0.0403	0.0413	0.188	0.122	0.139	0.126
All firm variables	0.113	0.0551	0.0513	0.0393	0.0467	0.0428	0.103	0.0900
R-squared	0.148	0.100	0.092	0.081	0.235	0.165	0.241	0.216
Observations	3,408	3,257	3,370	3,181	3,225	3,235	2,798	2,675

Notes: LF1=Proximity to suppliers, LF2=Proximity to clients, LF3=Supply of qualified labor, LF4=Supply of training and qualification facilities, LF5=Supra regional accessibility by traffic, LF6=Local traffic conditions, LF7=Proximity to universities, LF8=Proximity to research institutes

Dep. Var. Quality:	LF9	LF10	LF11	LF12	LF13	LF14	LF15
Model SSQ	336	238.3	221.9	174.6	314.9	314.9	282.3
Partial R^2							
District fixed effect	0.0572	0.0754	0.0839	0.0459	0.0675	0.0675	0.117
All firm variables	0.0643	0.0445	0.0418	0.0553	0.0992	0.0992	0.0367
R-squared	0.121	0.120	0.126	0.101	0.167	0.167	0.154
Observations	3,206	3,077	3,101	2,944	2,958	2,958	3,188

Notes: LF9=Performance of local banks, LF10=Performance of local labour office, LF11=Performance of local authorities, LF12=Performance of local promotion agencies, LF13=Support by the Länder government, LF14=Support by the chambers of commerce, LF15=Image of the region

Table 11: Multi-equation system estimation results - only endogenous variables and cross-equation correlations reported

MODEL FOR	Quality:	LF1	LF2	LF3	LF4	LF5	LF6	LF7	LF8
eq1: LF Very important		0.172***	0.155**	-0.0483	0.0428	-0.0268	0.0258	0.0506**	0.0485*
		(0.0656)	(0.0719)	(0.0303)	(0.0270)	(0.0301)	(0.0287)	(0.0253)	(0.0250)
eq1: Company's profit (scale 1-5)		0.0996***	-0.00372	-0.138***	-0.0856***	-0.0825***	-0.0671***	-0.0523***	-0.0685***
		(0.0206)	(0.0192)	(0.0218)	(0.0181)	(0.0213)	(0.0202)	(0.0201)	(0.0211)
eq2: Company's profit (scale 1-5)		-0.0701**	-0.0338	0.0869**	0.0751**	0.0273	0.0269	-0.0583	-0.122***
		(0.0357)	(0.0327)	(0.0346)	(0.0321)	(0.0326)	(0.0322)	(0.0420)	(0.0449)
Cross-equation error term correlation ρ_{ml}									
atanh ρ_{12}		-0.152*	-0.158	-0.158***	-0.0210	0.0869**	-0.0647	0.111**	0.151***
		(0.0885)	(0.102)	(0.0440)	(0.0458)	(0.0435)	(0.0434)	(0.0474)	(0.0480)
atanh ρ_{13}		-0.0685**	0.00824	0.109***	0.0975***	0.0651**	0.0457	0.0158	0.0722**
		(0.0300)	(0.0300)	(0.0294)	(0.0302)	(0.0299)	(0.0298)	(0.0328)	(0.0338)
atanh ρ_{23}		0.0469	0.0108	-0.0623	-0.0630*	-0.00702	-0.0217	0.0495	0.132**
		(0.0409)	(0.0371)	(0.0397)	(0.0365)	(0.0371)	(0.0365)	(0.0480)	(0.0516)

MODEL FOR	Quality:	LF9	LF10	LF11	LF12	LF13	LF14	LF15
eq1: LF Very important		-0.0971***	-0.0385*	-0.0109	-0.0135	-0.0407***	-0.00677	0.0295
		(0.0253)	(0.0207)	(0.0161)	(0.0165)	(0.0138)	(0.0155)	(0.0241)
eq1: Company's profit (scale 1-5)		0.175***	-0.0288	0.0288	0.0664***	0.0659***	0.00129	0.0404**
		(0.0243)	(0.0213)	(0.0196)	(0.0208)	(0.0210)	(0.0214)	(0.0192)
eq2: Company's profit (scale 1-5)		-0.0968***	-0.0772**	-0.0102	-0.0665*	-0.0356	-0.0915**	0.0617*
		(0.0335)	(0.0355)	(0.0358)	(0.0358)	(0.0377)	(0.0358)	(0.0325)
Cross-equation error term correlation ρ_{ml}								
atanh ρ_{12}		0.0314	0.141***	0.00961	0.222***	0.211***	0.367***	0.00717
		(0.0369)	(0.0366)	(0.0331)	(0.0341)	(0.0327)	(0.0328)	(0.0400)
atanh ρ_{13}		-0.147***	0.00585	-0.0390	-0.0672**	-0.0401	0.0140	-0.0409
		(0.0305)	(0.0310)	(0.0307)	(0.0313)	(0.0312)	(0.0305)	(0.0301)
atanh ρ_{23}		0.102***	0.0694*	-0.0142	0.0482	0.00815	0.0707*	-0.0753**
		(0.0356)	(0.0367)	(0.0357)	(0.0355)	(0.0357)	(0.0352)	(0.0351)

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, n=3,819 for all models (see text).

Notes: LF1=Proximity to suppliers, LF2=Proximity to clients, LF3=Supply of qualified labor, LF4=Supply of training and qualification facilities, LF5=Supra regional accessibility by traffic, LF6=Local traffic conditions, LF7=Proximity to universities, LF8=Proximity to research institutes, LF9=Performance of local banks, LF10=Performance of local labour office, LF11=Performance of local authorities, LF12=Performance of local promotion agencies, LF13=Support by the Länder government, LF14=Support by the chambers of commerce, LF15=Image of the region
The models consist of three equations, eq1: quality assessment (continuous), eq2: LF important (0,1), eq3: profit (continuous) and use the same regressors as in Tables 6-9. The multi-equation equation models are estimated using David Roodman's (2011) CMP procedure in STATA. Instruments are lagged profits, number of LFs perceived as important, financial liquidity shortage.