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Lock-In, Vertical Integration, and Intra-group Sales: The Case of Eastern European Firms

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Abstract: A key prediction of transaction cost economics is that the presence of relationship-specific assets increases the likelihood of vertical integration whenever contracts are incomplete. I explore a firm level data set on Eastern European and Central Asian firms, the BEEPS 2005 Survey provided by the EBRD and World Bank, to test this prediction. I measure lock-in by supplier substitution, and vertical integration by the presence of sales to the parent firm, and find the TCE prediction confirmed in the data: At the extensive margin, a firm whose customers are locked-in at medium or high levels is about 5 to 6 percent more likely to be vertically integrated than a firm whose customers are not locked-in. At the intensive margin, I find that high lock-in raises intra-group sales by about 2 percentage points. Being a large firm raises the probability of being vertically integrated significantly in itself, but does not alter the impact of lock-in on the probability of carrying out intra-group sales. Instead, operating in a non-manufacturing industry significantly reduces the probability of vertical integration, and also reduces the impact of high lock-in on the probability of having positive sales with a parent.

JEL classification: L14; L23; L25
Keywords: Transaction cost economics, vertical integration, transition economies

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1 Introduction

Over the past twenty-five years, the economies of Central and Eastern Europe (CEE) have undergone a radical transition from centrally planned to market economies, which allowed living standards to rise to unprecedented levels, and in some cases to almost catch up with Western European standards. At the heart of this transition was the restructuring of the productive system, be it through privatization of formerly state-owned firms, through foreign direct investment (FDI), or through home-grown business initiatives.

While the optimal sequencing of privatizations was at the center of attention in the early years of the transition period[1], the focus of research has since shifted towards studying the impact of FDI on CEE and EU economies, and the gradual integration of CEE countries into the world economy, in particular into the European Union.

The massive inflow of FDI in CEE countries has affected both host and home countries in a number of ways, and not always to their benefit. For instance, foreign investors have been accused of driving small local suppliers out of the market; this concern has been dismissed by a number of authors, at least for the agricultural sector; rather than hurting the local suppliers, the latter benefited from vertical and horizontal spillover effects of FDI, which led to improved access to finance, increased investments, product quality improvements, and growth of small local suppliers (see Gow and Swinnen 1998, Dries and Swinnen 2004, Dries et al. 2009).

However, Pavlínek (2004) gives a much less optimistic account of the impact of FDI on the local Czech automotive components industry: He identifies potentially adverse effects on the regional economy, such as the intensification of uneven development, the development of a dual economy, the failure to develop linkages with local and regional economies, and its contribution to increased regional economic instability. In a similar spirit, Fons-Rosen et al. (2013) find that the positive impact of FDI on aggregate growth seems to be much lower than generally assumed.

Regarding the impact of FDI on CEE's export performance, Hoekman and Djankow (1996) acknowledge that FDI inflows, which really took off in 1994, correlate highly with levels of intra-industry trade between CEE and EU economies; but if large investments in the automobile sector are excluded, foreign direct investment seems unlikely to have been a major force driving the growth of intra-industry trade. The authors argue that these exchanges and the underlying integration into the world economy mostly reflect arm's-length transactions between CEE firms and their Western European counterparts.

[1] See for instance Tirole (1991), Blanchard (1993), and Carlin et al. (1992) in the economics literature; Uhlenbruck and De Castro (2000), Brouthers et al. (2001), and Uhlenbruck et al. (2003), in the management literature.

Another key issue regarding FDI is their impact on the labor market both in the host country and in the country of origin. As far as the host country is concerned, Jude and Silaghi (2015) study a panel of 20 Central and Eastern European Countries during the period 1995–2012, and find that FDI initially has a negative effect on employment, while the progressive vertical integration of foreign affiliates into the local economy eventually converges toward a positive long run effect, at least for EU countries.

Whether FDI also displaces jobs in the home countries of foreign investors has long been a contentious issue: Braconier and Ekholm (2001) study firm-level data on Swedish multinationals to analyze how the recent expansion of affiliate employment in CEE has affected affiliate employment elsewhere. They find that employment in affiliates located in other low-wage countries in Europe decreased substantially as a consequence of the expansion in CEE, while the effects on employment in Sweden and other high-wage European countries, although present, are much smaller (see also Cuyvers et al. 2005).

The increased openness of CEE economies and their integration into the European Union has also raised a number of concerns in Western European countries. To begin with, the poorer EU countries such as Spain, Portugal and Ireland, were afraid that investors would divert FDI away from them and towards CEE countries. However, these concerns seem to have been unfounded, see Brenton et al. (1999). As far as the agricultural sector is concerned, Swinnen (2002) argues that trade concessions and market openings which provide farmers in CEE countries easier access to the common market causes major concerns for EU-15 farmers already facing a relatively declining sector and increased competition for EU subsidies under the Common Agricultural Policy.

While our understanding of the consequences of restructuring in CEE, and of FDI in particular, has dramatically improved over the last 20 years, we still know very little about why some firms decided to vertically integrate in the first place, while others specialized in one stage of production and maintained arm's-length relationships with other firms.

Economic theory offers two competing views on this question: Neoclassical theory views vertical integration as an attempt to earn monopoly rents by leveraging market power from monopolized input markets into competitive distribution channels, or vice versa.[2] The transaction cost approach, by contrast, emphasizes that vertical coordination can be an efficient means of protecting relationship-specific investments or mitigating other potential conflicts under incomplete contracting.[3] The starting point for the TCE ap-

[2] This view is still prominent in much of the antitrust literature; recently, the issue of partial vertical integration has received renewed attention, see Flath (1989), Greenlee and Raskovich (2006), Serbera (2011), Jovanovic and Wey (2013), Gonçalves (2013), Choi et al. (2014), Levy et al. (2015).

[3] See Oliver Williamson's (1975, 1985, 1996) influential work based on Coase's (1937) analysis of the boundaries of the firm

proach is the following: When contracts are incomplete, and parties develop relationship-specific assets, they face the hazard of ex post opportunistic behavior; each party may attempt to "hold up" the other to appropriate a larger share of the relationship-specific gains from trade, the so-called "quasi-rents". A central prediction of this theory is that higher levels of lock-in should make it more likely that the two parties integrate.

As transaction cost economics was developed in the 1970s and 1980s, a stream of empirical literature emerged explaining the "make-or-buy decision" using transaction cost reasoning (see next Section for a survey of this literature). However, all these papers rely on data of highly developed countries, typically the US. We know next to nothing about the driving forces of vertical integration in transition economies. This paper is an attempt to close this gap and to understand whether the major insights of TCE also carry over to emerging economies such as the CEE countries.

To do this, I will use a firm-level dataset called Business Environment and Enterprise Performance Survey (BEEPS) which, in its 2005 round, covers almost 10,000 establishments in 27 Eastern European and Central Asian countries. The dataset was collected by the European Bank for Reconstruction and Development and the World Bank. The declared goal of this survey was to "advise governments on ways to change policies and practices that impose a burden on private firms and to develop new projects and programs that strengthen support for enterprise growth" (see introductory statement of the questionnaire 2005).

A unique feature of the BEEPS dataset is that it contains information on the recipients of respondent establishment's sales, by asking specifically which share of sales is going to the government, to state-owned enterprises, to multinationals, to large domestic firms, small firms and individuals, and most importantly: to the establishment's own parent company or affiliated subsidiaries. This information, which is of great interest to researchers investigating vertical relations, is not typically available in any of the standard firm level datasets used in the literature; it gives us a unique insight into the strength of the vertical ties between an establishment and its parent.

I will define all those establishment that report such sales to their parent or affiliates as vertically integrated, while those firms which are independently owned and report sales to other large firms (domestic and foreign), but not to any parent, will be classified as vertically separated. This leaves us with a pure cross-section sample of about 3,300 firms, of which about 20 percent are vertically integrated with their customer, while the remaining 80 percent are vertically separated. Vertical integration will be used as dependent variable in our analysis.

The main explanatory variable will be the level of supplier substitution, which I construct from a question in the survey asking firm managers about the likely reaction of their customers following a hypothetical price increase of 10% for their main product line. I will consider the firm's customer as

highly locked in if such a price increase would have no impact on the quantities purchased, as mildly locked-in if the customer would reduce the quantities bought from its supplier (but nonetheless continue to buy from the same supplier), and as not locked-in if the customer would switch to another supplier.

Then, I test the key prediction of TCE theory, namely that more lock-in should make vertical integration more likely. The data clearly support this prediction, even after controlling for establishment size, age, industry and country characteristics: At the extensive margin, a firm whose customers are locked-in at medium or high levels is about 5 to 6 percent more likely to be vertically integrated than a firm whose customers are not locked-in. At the intensive margin, I find that high lock-in raises intra-group sales by about 2 percentage points.

This result applies to young and old firms alike. Being an exporter significantly reduces the impact of lock-in for very high levels of the latter. Being a large firm raises the probability of being vertically integrated significantly in itself, but does not alter the impact of lock-in on the probability of carrying out intra-group sales. Instead, operating in a non-manufacturing industry significantly reduces the probability of vertical integration, and also reduces the impact of high lock-in on the probability of having positive sales with a parent.

2 Literature Review

Most of the empirical work on the decision to vertically integrate[4] tries to test the transaction cost theory in a simple econometric framework in which the probability of observing a particular organizational form or governance structure (in-house production vs. outsourcing) is a function of certain properties of the underlying transaction, most notably asset specificity as defined by Williamson (1975, 1985, 1996). Organizational form is the dependent variable, while asset specificity is the main independent variable; to a minor extent, some studies have also included measures for uncertainty of demand or complexity and frequency of transactions into the framework to account for the level of contractual frictions that the parties are likely to encounter.

The key hypothesis is that we are more likely to observe a more integrated governance structure if the amount or value of the relationship-specific assets involved is relatively high. Organizational form is typically modeled as a discrete variable: "make or buy", for example, but there are also cases in which it is represented by a continuous variable.

To operationalize the explanatory variable, asset specificity is often proxied by technical specifications like product complexity, qualitatively coded

[4] See Joskow (2005) and Klein (2005) for excellent surveys on the empirical TCE literature.

from survey data or quantitatively assigned by inspection (Masten, 1984; Bigelow, 2001); worker-specific knowledge, again coded from survey data, as a proxy for human asset specificity (Monteverde and Teece, 1982; Masters and Miles, 2002); physical proximity of contracting firms, as a proxy for site specificity (Joskow, 1985; Spiller, 1985; González-Diaz, et al. 2000); and spatial and temporal proximity (Masten et al. 1991; Pirrong, 1993; Hubbard, 1999).

Where asset specificity cannot be easily measured, concentration has been used in single-industry studies to capture situations where small numbers bargaining situations are likely to appear (Ohanian, 1994).[5] Uncertainty is typically measured through sales variance (Levy, 1985; Anderson and Schmittlein, 1984) and some measure of technological uncertainty, such as the frequency of changes in product specification and the probability of technological change (Walker and Weber, 1984; Crocker and Reynolds, 1993).

The typical empirical approach we find in this literature is that of a case study (either qualitative or quantitative) which analyzes the make-or-buy decision in a single firm or industry; we rarely find cross-sectional or panel data from multiple firms or industries.[6] Canonical examples of the case-study strand of literature are Monteverde and Teece (1982), Masten (1984), and Joskow (1985). Monteverde and Teece (1982) study the make or buy decision (i.e. internal versus external procurement) in the automobile industry, more specifically for 133 components used by GM and Ford in 1976. The authors argue that not all of these components require the same level of engineering specific knowledge. Rather, components involving more specific knowledge also generate more hold-up risk, and are therefore more likely to be made in-house, while components requiring less specific knowledge can be procured externally.

Along similar lines, Masten (1984) investigates procurement decisions of a large aerospace company over 1,887 components. The key assumption is that the degree of component complexity also measures the difficulty of complete contracting. This variable and the degree to which the component was specialized to this aerospace firm were found to significantly affect the likelihood of vertical integration.

Joskow's (1985) paper studies the relationship between coal suppliers and electric plants that burn coal in the US for 1979. Some electric plants are "mine-mouth", meaning that they are located close to the coal mine that supplies them. Other plants are designed to burn a specific type of coal (but not necessarily from a specific supplier). Among other things, Joskow

[5] In this paper I will also use the number of a firm's competitor as an alternative measure for supplier substitutability, to complement the results we obtain from our main measure, namely lock-in.

[6] My paper clearly belongs to the second category, and is the first to explore TCE in a transition economy environment.

finds that mine-mouth plants are more likely to be integrated with the corresponding coal mine.

The common theme in these paper is that asset specificity is associated with tighter vertical coordination, a result that has since been confirmed for a large number of industries, including electricity generation (Saussier, 2000), aluminum (Stuckey, 1983; Hennart, 1988), forestry (Globerman and Schwindt, 1986), cable TV (Williamson, 1976), chemicals (Lieberman, 1991), engineering (Lyons, 1995), trucking (Nickerson and Silverman, 2003, Baker and Hubbard, 2003, 2004), offshore oil gathering (Hallwood, 1991), information technology (Ulset, 1996), electronic components (Weiss and Kurland, 1997), construction (González-Diaz et al. 2000), and even stock exchanges (Bindseil, 1997).

Let us now turn to those studies that have used cross-sectional or panel data to estimate TCE theory: Levy (1985) uses the ratio of value-added to sales as a cross-industry measure of vertical integration (where this ratio should approach 1 the more integrated production is in a particular industry, while it is closer to zero in industries with very fragmented vertical chains); the number of firms and amount of R&D spending as measures of asset specificity; and the variance of sales as a measure of uncertainty. Using data from 69 firms representing 37 industries, he finds each of the independent variables to have a statistically significant effect on the likelihood of vertical integration. Macmillan et al. (1986) obtain very similar results with a larger sample. Harrigan (1986), by contrast, finds sales variability to result in a lower chance of vertical integration, although she does not include a measure for asset specificity.

Caves and Bradburd (1988) construct a more complicated cross-industry measure of integration based on an input–output matrix of distribution shipments across several industries. They use this metric to compare asset specificity, small-numbers bargaining conditions, and risk as determinants of vertical integration. They find asset specificity and small-numbers situations, but not risk, to be significant.

More recently, some authors tried to address problems of selection bias and the effects of unobserved heterogeneity by using panel data. González-Diaz et al. (2000) assemble a panel of Spanish construction firms over a six-year period and study the use of independent subcontractors. They regress the percentage of subcontracting on a distance-based measure of asset specificity, a measure of uncertainty, time and firm-fixed effects, and other control variables. They find that asset specificity, but not uncertainty, explains most of the outsourcing decision, even when controlling for unobserved heterogeneity. Other studies using panel data, such as Ohanian's (1994) investigation of vertical integration in the U.S. pulp and paper industry and Lafontaine and Shaw's (1999) study of franchise contracting, also support transaction cost explanations even when fixed effects are included.

Forbes and Lederman (2009) study the incentives for major US airlines

to vertically integrate with small regional airlines that operate low-density short and medium-haul flights on the major airline's behalf out of the same airport. Owning a regional partner mitigates incentive problems that arise when unforeseen schedule disruptions, such as bad weather conditions, require the major to make changes that involve its regional partner's operations.

Finally, TCE has been used to study management strategies, in particular regarding the choice of the optimal mode of entry, and the level of equity ownership to hold in a new market. Delios and Henisz (2000) maintain that a foreign investor's ability to deal with public and private expropriation hazards in the host countries is not stable over time, but will grow with this firm's prior experience. They study a sample of 660 Japanese firms which made a total of 2,827 investments in 18 emerging economies in Africa, Asia, Europe, and Latin America, and they conclude that a firm's prior experience enhances hazard-mitigating capabilities and thus reduces sensitivity to public and private expropriation hazards, leading to increases in equity ownership in foreign subsidiaries.

3 The Estimation Equation

In our regression analysis, we will analyze the role of supplier substitution (or lack thereof) on the corporate structure of the establishments in our sample. We will study vertical integration both at its extensive margin and at the intensive margin, i.e. we study whether or not a firm has positive sales to its parent, and how intense this sales relationship is. We will therefore use different econometric models to accommodate these two dimensions of vertical integration.

Our baseline model for vertical integration at the extensive margin will be the following non-linear probability model:

$$VI = \Phi\left(\beta_1 LI_1 + \beta_2 LI_2 + \beta_3 LI_3 + X\beta_x + \varepsilon\right) \tag{1}$$

where VI is a dummy variable taking value 1 if the firm is vertically integrated (i.e. if it reports a positive level of sales to its parent); $\Phi(\cdot)$ is the link function (either the cumulative normal distribution, or the logit function); LI_1, LI_2, LI_3 are dummy variables taking value 1 if the firm reports low, medium, or high lock-in, respectively (the complementary variable being "no lock-in", which is excluded from the regressions to avoid multicollinearity); and X is a vector of firm-specific controls: the firm's age and size, its exports (as share of total sales), its industry and country, and the way it was established (privatized, originally private etc.); and ε is the usual error term.

With a dichotomous dependent variable, OLS estimation has some serious limitations, which is why non-linear probability models are generally preferred over OLS in this case: (i) They constrain the predicted values to

fall between 0 and 1, so that we can interpret these predictions as probabilities of observing vertical integration; (ii) They deliver reliable results even if the sample size is not very large (no huge concern here); and (iii) with a probit model, errors are easier to correct in case of heteroscedasticity.

We will also try to shed light on the role of lock-in for the intensity of the vertical relationship. To this end, we will use our observations on the share of intra-group sales in a firm's total sales as dependent variable; this variable runs from 0 to 100, but has a large number of zeros, and positive mass on all multiples of 10 and on some "focal" levels such as 25 and 75; it is therefore not clear whether to classify it as a censored continuous variable or as a count variable.

Typically, if the data exhibit numerous zeros and have a long upper tail (as is the case for our observations on intra-group sales), OLS will not be able to reproduce these features in its predicted values; we will therefore supplement our OLS analysis with two models frequently used in the analysis of count data, namely the Poisson model and the Ordered Probit. A key requirement of a Poisson process is that the conditional mean (i.e., the expected outcome if the predictors equal their mean values) should equal the conditional variance (i.e., the variance of the expected outcome). Sometimes, the dependent variable is over-dispersed, so that the conditional variance exceeds the conditional mean. We run a test for the goodness of fit of the Poisson model, which does not reject the hypothesis that the conditional mean equals the conditional variance, so that our Poisson results do not seem to be problematic.

The ordered Probit is typically used when the LHS variable is ordered, but the intervals between the scores are arbitrary; this is of course not the case for our dependent variable, which is cardinal. Still, I provide results also for this model to complement the results from OLS and the Poisson model.

4 The Data

The Business Environment and Enterprise Performance Survey (BEEPS) is a joint initiative of the European Bank for Reconstruction and Development (EBRD) and the World Bank Group. The survey was first undertaken in 1999 - 2000, when it was administered to approximately 4,000 enterprises in 26 countries of Central and Eastern Europe (CEE) (including Turkey) and the Commonwealth of Independent States (CIS). The aim of the survey was to investigate how enterprise restructuring behavior and performance were related to competitive pressure, the quality of the business environment, and the relationship between enterprises and the state.[7] The second round of the BEEPS took place in 2002 and covered about 6,500 enterprises in 27

[7] A detailed description of the questionnaire and the implementation of the 1999 survey can be found in Hellman et al. (2000).

countries (including Turkey but excluding Turkmenistan).

The present paper builds on the third round of the BEEPS, which is a cross-section of 9,655 enterprises in 27 transition economies: 16 from CEE (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, FR Yugoslavia, FYROM, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia and Turkey) and 11 from the CIS (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine and Uzbekistan). Each country is represented by 200 - 300 establishments, with the exception of the following countries, where larger samples were drawn: Poland (975 establishments), Hungary, Russia, Turkey, Ukraine, Kazakhstan, and Romania (about 600 each).

According to the July 2005 survey report by Synovate, who implemented the survey on behalf of EBRD and World Bank, the BEEPS 2005 sample was designed to replicate the sample distribution of BEEPS 2002 to maintain comparability between the two data sets. In the BEEPS 2002 survey, the sectoral composition of the sample in terms of manufacturing (including agro-processing) versus services (including commerce) was determined by their relative contribution to GDP. Firms that operate in sectors subject to government price regulation and prudential supervision, such as banking, electric power, rail transport, and water and waste water, were excluded from the sample. Enterprises which began operations in 2002, 2003 and 2004 were excluded from the sample as well. As the main survey was conducted from 10th March through 20th April 2005, this means that each establishment in the sample has a business history of at least three years.

In addition, the sample was required to meet the following minimum quotas:

- Size: At least 10% of the sample was to be in the small (2 - 49 employees) and 10% in the large (250 - 9,999) size categories. Firms with only one employee or more than 10,000 employees were excluded.

- Ownership: At least 10% of the establishments were to have foreign control and 10% state control (where control means more than 50% shareholding)

- Exporters: At least 10% of the establishments were to be exporters (exports accounting for 20% or more of total sales)

- Location: At least 10% of establishments were to be in the category small city / countryside (population under 50,000 inhabitants)

The BEEPS sample also has a small panel dimension, because the BEEPS 2005 survey covers some 1,500 respondents who already participated in BEEPS 2002 and had agreed, at that time, to participate in future rounds of the BEEPS.

Table 1: Q4a - Firm's largest shareholder currently

	Frequency	Percent	Cumulative
1 Individual	6,102	63.65	63.65
2 Family	877	9.15	72.80
3 General public	86	0.90	73.69
4 Domestic company	492	5.13	78.83
5 Foreign company	531	5.54	84.36
6 Bank	7	0.07	84.44
7 Investment fund	40	0.42	84.85
8 Managers of the firm	221	2.31	87.16
9 Employees of the firm	223	2.33	89.49
10 Gov't or gov't agency	852	8.89	98.37
11 Other	156	1.63	100.00
Total	9,587	100.00	

The survey was conducted by means of face-to-face interviews with top level firm managers or owners in site visits, and encompasses questions on the business environment (such as business regulation and taxation, law and order and the judiciary, and on infrastructure and financial services, administrative corruption, and state capture), and on firm performance, in particular on the growth of firms, including the decisions to invest and to innovate, and the growth of revenues and productivity.

The novelty of the data set in the empirical TCE literature calls for a careful descriptive analysis. Let us start with a careful description of the dependent and the key explanatory variable in our econometric exercise.

4.1 The dependent variable

The BEEPS 2005 sample covers a total of 9,655 establishments. For 9,587 of these establishments, Question 4a of the questionnaire provides ownership information which allows us to identify establishments belonging to a business group from those owned independently (see Table 1).

Category 11 ("other") captures those establishments which do not have a single largest shareholder, but two or more largest shareholders of different type among the categories 1 through 10. Firms belonging to category 4 or 5, and those establishments in category 11 having either a domestic or a foreign company among their largest shareholders, will be considered a "subsidiary" in the following. This is the case for 1,102 establishments, or about 11% of the total sample.

Next, we want to find out whether there are any business transactions running along these ownership ties. Survey Question 9 allows us to shed light on the identity of the main customers on the domestic market with whom the establishments in our sample have trade relationships (Table 2).

Table 2 - Q9 - What percentage (from 0 to 100) of your domestic sales are to:

		Mean	Std. dev.
1	Government or government agencies (excluding state-owned enterprises)	4.26	14.35
2	State owned or controlled enterprises	6.93	18.05
3	Multinationals located in your country (not including your parent company, if applicable)	3.93	13.72
4	Your firm's parent company or affiliated subsidiaries	2.81	13.54
5	Large private domestic firms (those with approx. 250+ workers) (not including your parent company, if applicable)	13.51	24.64
6	Small firms and individuals	65.96	38.26
7	Other	2.60	13.88

The distribution of sales shares is very skewed for all categories of Q9: for Category 6 (small firms and individuals) the median response is 85%, while for all other categories the median response is zero. This suggests that the establishments in our sample fall into two broad categories: a large group which mainly (or exclusively) deals with small firms and individuals, and a small group of establishments which mainly deal with large entities of the private or public sector. The focus of this paper will clearly be on the latter category.

Question 9 is crucial for our purpose, because it allows us to identify those establishments which have a supply relationship with their parent firm, and to measure the strength of this tie in terms of the share of such intra-group sales in the respondent's overall sales. If an establishment has positive sales to its own parent or affiliated subsidiaries (i.e. the establishment reported at least 1% under category 4 of Q9), then I will call this establishment a "vertically integrated (VI) firm". These are establishments which operate along the same vertical chain as their owner (or one of their owners, if there are more than one); more precisely, they act as suppliers (i.e. are located upstream) to their parent or affiliated subsidiary, i.e. we are looking at cases of so-called "*backward* vertical integration" (as opposed to *forward* VI, where the supplier holds a stake in its customer/retailer). This is the case for 660 establishments, or 7% of the total 9,327 establishments who supplied information on Q9.

The counterparts to these VI firms are identified as those establishments that, according to Q9 of the survey, act as suppliers to other large firms, but - unlike the VI firms - are independent from their customers in terms of ownership. I will define a firm as "vertically separated (VS)" if it is independently owned (i.e. not a "subsidiary" in the sense of Question Q4a), it reports zero sales under category 4 of Q9, and at least 1% of its (domestic) sales are to either multinationals or large private domestic firms (categories 3 and 5 in Question 9). The threshold level of 1% was chosen to mirror the corresponding 1% threshold of intra-group sales for the VI firms, allowing

us to create the largest possible pool of VS firms to confront our VI firms with. There are 2,686 establishments satisfying these criteria, accounting for 29% of the full sample of 9,327 establishments who answered Q9.

Note that while all VS firms are non-subsidiaries by definition, the VI establishments may or may not be "subsidiaries", and vice versa: Out of a total of 1,102 subsidiaries in our sample, as many as 890 (81%) do not supply their parent (they may either buy from their parent or have no sales relationship with this parent at all); and 505 out of the 660 firms reporting intra-group sales (77%) are not categorized as subsidiaries, implying that the parent they sell to is just one of their owners, but not the largest shareholder.

In other words, the vast majority of our VI firms display only partial vertical ownership. While this paper is the first to document this phenomenon for transition economies, it has been studied in some detail for the US economy.[8] In their study on corporate block ownership in the US, Allen and Phillips (2000) construct a sample of 402 ownership stakes established during the 1980 to 1991 period, covering all partial acquisitions by non-financial corporations that exceeded a minimum of five percent of outstanding shares; the mean fraction acquired was 20 percent of voting shares, with a median of merely 14 percent. 37 percent of target firms in their sample reported explicit product market relationships with their corporate blockholder (i.e. buyer/supplier agreements, marketing/distribution arrangements, technology sharing, joint R&D projects, or other service agreements related to their primary business activities.)

Boone (2003) studies a sample of 220 US equity carve-outs of wholly owned subsidiaries that occurred over the period 1985-1996. She finds that following the IPO, the level of parental ownership retention varies from zero percent (no ownership) to 95% of the subsidiary's equity, although almost three-fourths of the parent firms retained *at least* 50% of the subsidiary's equity, implying that as many acquirers obtained a stake of *less than* 50% in the same subsidiary. Moreover, 35% of the parents chose to retain partial ownership stakes in their subsidiaries for the full four-year examination period over which Boone tracks these carve-outs, while some parents completely divested their holdings later, and others chose to reacquire all of the equity in the subsidiary so that it was once again wholly owned.

Kang (1993) investigates the performance of Japanese cross-border acquisitions of US firms over the period 1975 - 1988. Restricting the sample to those transactions for which stock price data are available on a daily basis, he obtains a sample of 119 Japanese bidders and 102 US targets. Out of the 119 Japanese bidders, 30 cases were mergers and tender offers, 30 cases were

[8] A textbook example of partial vertical integration is the U.S. cable TV industry, where several operators acquired partial ownership stakes in cable or television networks (see Waterman and Weiss 1997, O'Brien 2000, and Goolsbee 2007); Foros et al. (2011) investigate a similar case in the Scandinavian cable TV market.

Table 3 - Defining criteria for vertically integrated vs. separated firms

	Integrated	Separated
Subsidiary (Q4a - cat. 4 or 5)	yes or no	always no
Sales to own parent (Q9 - cat. 4)	always yes	always no
Sales to multinationals (Q9 - cat. 3)	yes or no	always yes
Sales to large private domestic firms (Q9 - cat. 5)	yes or no	always yes

partial acquisitions, and the remaining 59 cases were acquisitions of units. From the point of view of the US targets, 21 cases were mergers and tender offers, 26 cases were partial sales of independent firms, and the remaining 55 cases were divestitures.

A similar picture also emerges, at least for foreign investment (both financial and industrial), in many other economies worldwide: Fons-Rosen et al. (2013) study a large panel of 134,000 firms from 12 developed and 13 emerging countries, over the period 1999–2008, and track their foreign ownership shares for this period: In developed countries, 30 percent of all firms with non-zero foreign ownership had less than 20 percent foreign ownership, and another 15 percent had ownership shares between 20 and 60 percent. These figures are significantly lower in emerging market economies, where only 17 percent of partially foreign owned firms have a stake of less than 20 percent, and 15 percent have a stake of somewhere between 20 and 60 percent.

Unfortunately, there is no question in the BEEPS about *supplier* details corresponding to Q9, so that it is not possible to identify the "downstream" analogues to our VI and VS firms, i.e. those establishments who *buy* from their parent (or from some major domestic or foreign firm they are independent from in terms of ownership). Likewise, for those establishments whose sales are not confined to the domestic market, i.e. who *export* part or all of their output, we do not have any customer information analogous to that of Q9. However, some 57% of all VI establishments do not export at all, and only 13% have more than half of their sales on the export market. Among the non-VI firms, a staggering 75% does not have any exports, and less than 8% have more than half of their sales on the export market. Thus, concentrating our analysis on those establishments which only serve the domestic market does not seem too restrictive.

Table 3 summarizes the defining criteria for vertically integrated and separated firms. To summarize, our final sample now includes 3,346 establishments, all of which have at least 1% of their sales with large firms on the domestic market. Out of these 3,346 "upstream" establishments, 660 establishments (or 20%) are vertically integrated with their main customer, while the remaining 2,686 (or 80%) are vertically separated. Among the vertically integrated suppliers, 74 establishments (or 11%) have a domestic parent, 70 establishments (or 10%) have a foreign parent, 11 establishments have either

Table 4 - Q11 Customer reactions following a unilateral price increase of 10%

Our customers would continue to buy from us:	
(i) in the same quantities as now	1
(ii) but at slightly lower quantities	2
(iii) but at much lower quantities	3
Many of our customers would buy from our competitors instead	4

a domestic or a foreign company among their largest shareholders, and the remaining 505 establishments (or 77%) have a parent firm who is not among the largest shareholders (and hence not classified as subsidiary).

4.2 The explanatory variable

The key explanatory variable proposed by TCE is the lack of supplier substitution (see Joskow 2005, Klein 2005). The BEEPS data set offers a good measure for the presence of lock-in through Question 11, which asks: "If you were to raise your prices of your main product line or main line of services 10% above their current level in the domestic market (after allowing for any inflation) which of the following would best describe the result assuming that your competitors maintained their current prices?" (see Table 4)

Some readers may find this question reminiscent of a SSNIP test ("Small but Significant and Non-transitory Increase in Price"), a standard tool in antitrust policy to determine a firm's relevant geographic and product market: The application of the SSNIP test involves interviewing consumers regarding buying decisions and determining whether a hypothetical monopolist or cartel could profit from a price increase of 5% for at least one year (assuming that "the terms of sale of all other products are held constant"). If a sufficient number of buyers are likely to switch to alternative products and the lost sales would make such price increase unprofitable, then the hypothetical market should not be considered a relevant market for the basis of litigation or regulation.

In a very similar spirit, Question 11 asks establishments about the likely reaction of their customers to a 10% price increase not matched by any of their competitors. If supplier substitution is possible, then the answer to Q11 should be 4 ("Many of our customers would buy from our competitors instead"), and so the customers of this particular establishment cannot be considered as locked in to their current supplier, i.e. "lock-in" is nonexistent. If the answer is instead 1, 2, or 3, then supplier substitution is either impossible (answer 1 to Q11) or at least difficult (levels 2 and 3).

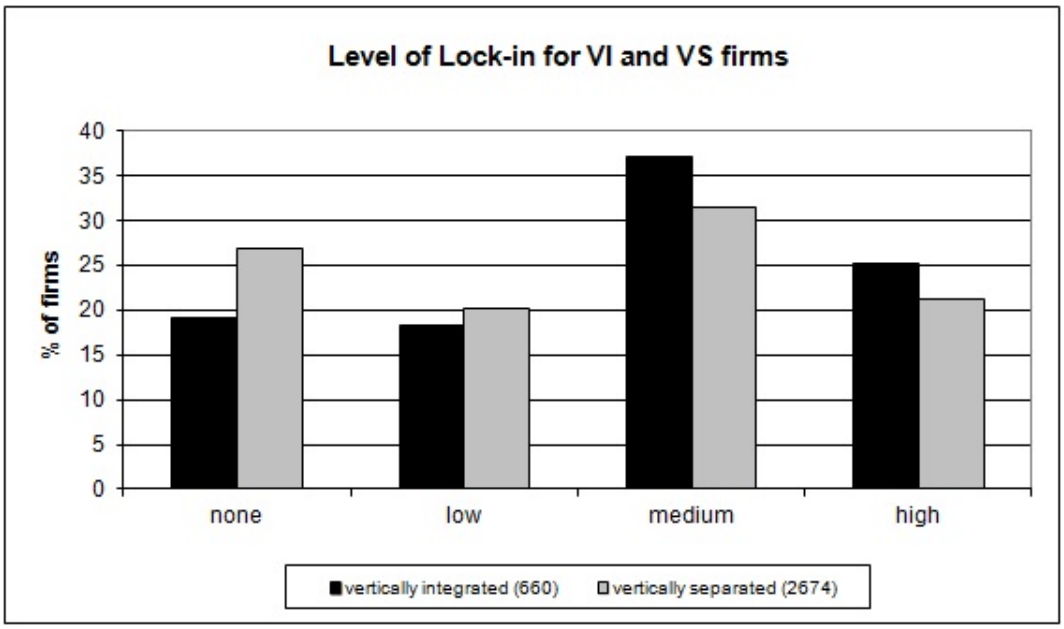
Note that this multi-level measure of supplier substitution is of course not a cardinal measure: The interval between any pair of categories (e.g. between low and medium lock-in) cannot be assumed to be of the same magnitude as the interval between any other pair (e.g. between medium

and high lock-in). We will therefore map the responses to Q11 into four dummies, which correspond to either no lock-in (Q11 = 4), low (Q11 = 3), medium (Q11 = 2), or high lock-in (Q11 = 1).

Figure 1 illustrates the frequency of responses to Question 11 for the two groups of firms that we are interested in, the VI and VS firms. To begin with, note that each of the four categories receives a fair amount of responses (at least 18 percent of the total population), i.e. there are no strong disparities in the frequencies across categories. In particular, medium and even high levels of lock-in seem to be quite common, with more than 50 percent of establishments among both VI and VS firms reporting one of the top levels of lock-in.

Second, note that VI firms (black bars in Figure 1) are less likely than VS firms to report no or low lock-in (19 percent of the VI firms against 26 percent of the VS firms report no lock-in, and 18 percent of VI firms report low lock-in, as opposed to 20 percent of the VS firms); instead, VI firms are more likely than VS firms to report medium and high levels of lock-in (37 percent of VI firms report medium lock-in and 25 report high lock-in, as opposed to 31 and 21 percent of VS firms, respectively). As the χ^2 statistic reported in Table 5B shows, the distribution of responses for VI firms is significantly different from that for VS firms, suggesting that our raw data already lend some support to the link between lock-in and corporate structure as proposed by TCE.

Figure 1 - of lock-in for integrated and separated firms



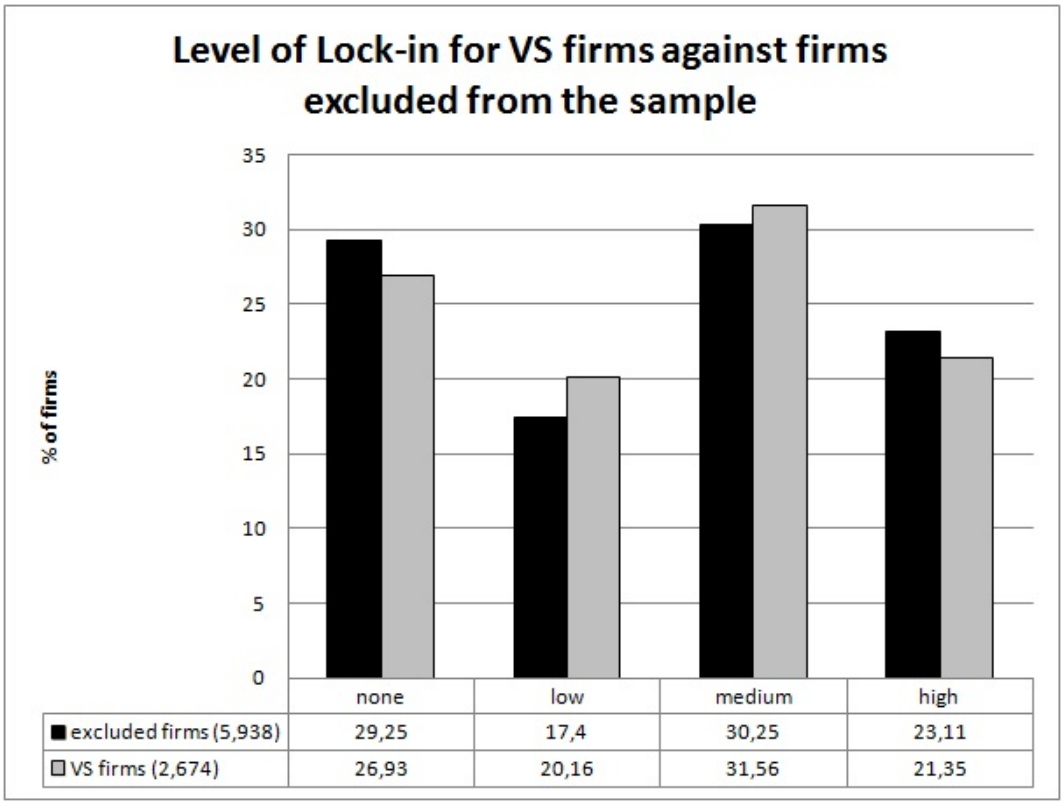
One may wonder if this is an artefact of the way we defined vertical separation: If our defining criteria for VS firms happened to apply only to firms that have a much lower propensity to report medium and high

lock-in than the average firm in our sample, our analysis would suffer from selection bias. To convince the reader that this is not the case, let us compare the distribution of lock-in among VS firms in our sample with that of the firms that were excluded from the sample because they neither qualify as VI nor as VS firms.

Figure 2 shows that if anything, VS firms are somewhat more likely to report low and medium levels of lock-in, while they are less likely to report either no or a high level of lock-in. In other words, the distribution of lock-in levels is somewhat more compressed at the center for VS firms, and more dispersed for those firms excluded from the sample. The Pearson χ^2 statistic is 14.7463, which means that the two distributions are different at the 1% level.

However, we see that VS firms do not systematically report lower levels of lock-in than the excluded firms. We will further investigate the question of a possible selection bias in our section on the regression results, where we will present robustness checks using the full sample including all firms that participated in the BEEPS, to compare against the baseline regressions which were performed on the reduced sample including only VI and VS firms.

Figure 2 - Level of Lock-in for VS firms and firms excluded from the sample



Some readers may wonder whether the survey question regarding sup-

plier price increases is at all meaningful in the context of a vertically integrated structure, i.e. whether vertically integrated customers still have to pay a price for the supplies they receive from an affiliated supplier, so that we can interpret the answers to Q11 given by the vertically integrated respondents in the same way as we do for the non-integrated counterparts.

It turns out that such prices, called "transfer prices" in the international trade literature, continue to exist even after a supplier vertically integrated with its buyer. When such intra-group transactions are cross-border, there are two main reasons why a business group may want to distort its transfer prices: Either to shift profits from high-tax countries to low-tax countries, or to channel exports though third countries that have lower tariffs with respect to the final destination country than the original source country (see for instance Bernard et al, 2006). Such considerations clearly play no role if the intra-group transactions are domestic (as is the case for the establishments in this paper), so that there is no reason why a business group may want to distort its domestic transfer prices; rather, these prices have important signalling and incentive functions, e.g. when it comes to deciding what share of the supplier's productive capacities to allocate to internal customers, and which part to dedicate to external customers.

Of course, our data on lock-in as reported by the firms is far from being a perfect measure of supplier substitution: To begin with, our lock-in variable is survey-based: The suppliers were asked to report what they believed to be the likely reaction of their customers to a hypothetical price increase of 10 percent, something they may never actually have tried out; second, the question explicitly refers to the main product line or line of services, which may or may not be the one sold to the parent or its subsidiary; and finally, we cannot rule out the possibility of reverse causality: Once a customer is vertically integrated with its supplier, they may engage in relationship-specific investments as a result of which lock-in may increase over the years.

To address these concerns at least partially, we will run a robustness check using an alternative proxy for supplier substitution, namely the number of competitors the respondent faces for their main product line or service in the national market (Question 12ba). Our results using the number of competitors as explanatory variable strongly confirm the ones we obtain using the lock-in variables derived from Question 11 instead. This is reassuring, since the number of competitors is arguably a straightforward question about a hard fact that does not require any guessing on the part of the respondents.

Another set or robustness checks restricts the sample of VI firms to include only dedicated suppliers, i.e. firms who have 70 or even 80 percent of their sales with their own parent; clearly, for these firms, the "main product line or line of services" must coincide with the one they sell to their parent. Again, we find that our results obtained from the larger sample are confirmed for this restricted sample, so that we should not be too concerned

Table 5A - Descriptive Statistics for (near) continuous variables

	VI firms			VS firms			T-test for
	Mean	Std. dev.	# obs.	Mean	Std. dev.	# obs.	mean diff.
Log sales	7.24	1.902	449	6.53	1.733	2,037	t = 7.7776***
Age (in yrs.)	18.24	21.198	660	15.26	17.882	2,682	t = 3.6891***
Export share	14.98	25.469	660	11.12	22.371	2,686	t = 3.8576***

about Question 11 missing out on the product that is actually sold to the parent.

Finally, to mitigate the problem of reverse causality, the regressions will only include binary indicators of lock-in (rather than the original categorical variable of Q11), and I also run a series of robustness checks on that variable, where I consider different mappings of the ordinal lock-in variable into one or two binary indicators; to the extent that reverse causality needs time to operate, it should be less of a problem when looking at very young firms; it is therefore reassuring that we still find a very strong and significant effect of lock-in on vertical integration even among firms of less than four years of age, i.e. among startups.

4.3 Descriptive Statistics

We can now compare the two groups of establishments - vertically integrated and separated - with respect to standard firm characteristics like size, age, mode of establishment, and industry. Table 5A reports descriptive statistics for all (near) continuous variables of interest, while Table 5B reports summary statistics for the categorical variables:

The first row of Table 5A shows the distribution of annual sales for both vertically integrated and separated firms. The BEEPS Survey does not report exact sales figures, but assigns each establishment to one of 13 sales bins (see Figure 3 in the Appendix for the relevant upper bounds for each bin[9]). We see that the sales distribution of the vertically integrated firms (black bars) is clearly to the right of that for the separated firms (grey bars): integrated firms tend to be larger than separated ones. Mean sales for the VI firms are about 6.3m USD, while VS firms have about 3.2m USD, i.e. half of the VI sales on average. The t-test on the means of log sales for both categories confirms that VI firms tend to have significantly higher sales than their non-integrated counterparts.

Regarding establishment age, we see that integrated firms tend to be somewhat older than separated firms. Figure 4 (see Appendix) shows the distribution of foundation years for both categories of firms; the graph was truncated from the left at 1970, but the year of establishment is available

[9] The numbers reported in the figures sometimes rely on a smaller sample because of missing values in an indicator of interest; the underlying sample size for each group is indicated in the legend of each figure (in brackets).

Table 5B - Descriptive Statistics for categorical variables

Variable	Categories	VI firms % response	VS firms % response	Pearson χ^2 Test
Lock-in	None	19.09	26.93	χ^2 = 22.7034***
	Low	18.33	20.16	
	Medium	37.27	31.56	
	High	25.30	21.35	
# of full-time employees	2 - 49	49.70	67.30	χ^2 = 72.0849***
	50 - 249	32.27	21.86	
	$\geq$ 250	18.03	10.84	
Mode of establishment	Privatization	23.00	14.09	χ^2 = 52.1028***
	Orig. private	68.65	81.83	
	Private sub.	2.90	1.26	
	JV with foreign	3.75	1.96	
	Other	1.70	0.86	
Industry	Mining	2.42	1.04	χ^2 = 36.5250***
	Construction	10.00	11.73	
	Manufacturing	50.61	44.64	
	Transport, Comm.	7.27	6.85	
	Wholesale, retail	15.91	21.74	
	Real estate	6.67	9.01	
	Hotels	4.24	2.01	
	Other	2.27	2.49	
	Diversified	0.61	0.48	

for all establishments, including those founded before 1970 (accounting for less than 12% of our sample). We see that there was a real boom in the creation of new establishments starting in 1990, the year which marks an important structural break for all transition economies; in our sample, more than three-quarters of all establishments (2,566 out of 3,342) were founded from 1990 onwards, with an almost even distribution across the years 1990 to 2001.[10] Note that in the regressions, we will use firm age at the time of the survey (i.e. the difference between foundation year and 2001) rather than foundation year itself as control variable.

As for the share of exports in the firm's total sales, we see that integrated firms tend to export more than separated firms, namely about 15 percent against 11 percent for the separated ones. However, in both groups, the distribution of export shares is very skewed: the median firm reports zero exports, while the top 10 percent among the exporters ship more than half of their output abroad (see Figure 5 for a histogram of export shares of both integrated and separated firms).

Let us now turn to the categorical variables. Table 5B reports the percentage of the responses by category and firm type (i.e. VI vs VS), as well as a Pearson χ^2 Test for each variable. We see that VI firms differ significantly from VS firms in the distribution of responses for each of the following variables.

[10] Recall that firms established after 2001 were excluded from the BEEPS sample.

The first part of Table 5B shows the distribution of degree of lock-in among vertically integrated and separated firms (see also Figure 1 above). We see that vertically integrated firms are more likely to report medium and high levels of lock-in, while separated firms are more likely to report low levels of lock-in.

The size pattern we found before when comparing log sales is confirmed if we measure establishment size by the number of full-time employees instead (see also Figure 6). This variable only encompasses three size categories (small, medium, large), but it is a useful complement to the sales variable, because it is available for all establishments, while only 75 percent of our sample also reported sales figures. We see that two thirds of the separated firms have less than 50 full-time employees, while only half of the integrated firms fall into this category. The pattern is reversed for large establishments: 18% of the vertically integrated firms have more than 250 full-time employees, while only 10% of the vertically separated firms reach this size. We will use this categorical variable, rather than log sales, as firm size control in our regressions, because log sales might be endogenous to the dependent variable, because the latter is constructed from sales data as well (intra-group sales are of course part of the firm's overall sales).

As for the way in which the company was established, Table 5B illustrates that vertically separated firms are more likely to be established as originally private firms, while vertically integrated firms are more frequently created through privatization, as private subsidiaries of formerly state-owned firms, or as joint ventures with foreign partners (see also Figure 7).

As for the sector composition of our sample, an establishment is assigned to a particular sector if it reports more than 50% of its sales in this sector. If an establishment does not have more than 50% of its sales in any single sector, it is assigned to the category "diversified" (17 establishments, or 0.5%, of our full sample). Figure 8 shows that vertically separated firms are somewhat overrepresented in construction and wholesale/retail trade, while integrated firms are relatively more frequent in manufacturing and mining; in the remaining sectors (transport, real estate, and hotels & restaurants), the shares are very similar.

Regarding establishment location, Figure 9 demonstrates that vertical separation is particularly dominant in Kazakhstan, Romania, Hungary, Ukraine, and Poland, while vertical integration is more frequent in Azerbaijan, Slovenia, Bosnia, Turkey, and Serbia.

Finally, for those 660 establishments who report positive intra-group sales, Figure 10 shows the CDF of intra-group sales for three sub-samples, namely for those firms that reported either low, medium, or high lock-in. We see that for each level of lock-in, the share of intra-group sales varies widely among the VI firms. In line with Atalay et al. (2014), I find that only a small portion of vertically integrated firms can be categorized as dedicated suppliers of their parent firm: About 70 percent of these establishments report

to sell less than 50 percent of their total production to their parent; and only 15 percent of these establishments ship more than 90 percent of their output to their parent. We see that the CDF for high lock-in first-order stochastically dominates the one for low lock-in, while there is no clear relationship between the CDFs for medium and high lock-in.

5 Results

5.1 Baseline Regressions

Let us start by analyzing vertical integration at the extensive margin, i.e. whether or not a firm has sales transactions with its own parent. This dummy variable takes the value 0 if no such sales are reported, and value 1 whenever a strictly positive level of intra-group sales is carried out. We will later compare the results at the extensive margin with those at the intensive margin.

Table 6 shows the results of four different probit specifications, estimating the impact of each of the three levels of lock-in that a firm may report, on the probability of an establishment having sales to its parent. The four possible answers to question Q11 where transformed into dummies as follows: 1 = "lock-in high", 2 = "lock-in medium", 3 = "lock-in low". Those firms who reported level 4 in Q11 are classified as exhibiting no lock-in, i.e. they are assigned value zero in all three lock-in dummies.

The four specifications differ by the set of covariates included in the regression: Probit 1 only includes the three levels of lock-in, Probit 2 controls for the establishment's export share in total sales, its size and age, as well as its mode of establishment, while Probit 3 adds industry and country dummies; finally, Probit 4 replaces the industry and country dummies of Probit 3 with the full set of industry country interactions. (Numbers in brackets next to a covariate's name indicate the total number of categories available for this categorical variable.)

We see that the dummies for medium and high levels of lock-in are positive and highly significant in all specifications. The regression coefficients reported in Table 6 (and in all following probits) are always *marginal* effects; we can thus read the results in Probit 4 as saying that, keeping all other relevant firm characteristics at their mean level, a firm which goes from no lock-in to medium lock-in is about 5 percent more likely to be vertically integrated, and going from no lock-in to high lock-in raises the probability of vertical integration by almost 6 percent. Performing a χ^2 test on the difference between the two coefficients, medium and high lock-in, we obtain a χ^2 statistic of 0.17, so that we cannot reject the hypothesis of equality at any meaningful significance level.[11]

[11] The χ^2 test on the difference between medium and high lock-in is not significant at the 5%

Table 6 - The determinants of vertical integration - Baseline regressions

Dependent variable: Firm is VI (extensive margin)				
	Probit 1	Probit 2	Probit 3	Probit 4
Lock-in low	.0396*	.0332	.0150	.0124
	(.02292)	(.02325)	(.02245)	(.02416)
Lock-in medium	.0829***	.0655***	.0426**	.0484**
	(.02012)	(.02055)	(.02026)	(.02213)
Lock-in high	.0856***	.0795***	.0520**	.0590**
	(.02293)	(.02388)	(.02368)	(.02631)
Export share		.0007**	.0007**	.0006*
		(.00030)	(.00031)	(.00035)
Firm age		-.0004	-.0004	-.0006
		(.00053)	(.00054)	(.00057)
Firm size (3)	No	Yes	Yes	Yes
Mode of establ. (5)	No	Yes	Yes	Yes
Industry (8)	No	No	Yes	No
Country (26)	No	No	Yes	No
Ind. x Country (208)	No	No	No	Yes
# of obs.	3,334	3,027	3,027	2,739
Pseudo-R^2	0.0070	0.0359	0.0924	0.1148
*/**/*** means significant at the 10/5/1 percent level.				
Reported probit coefficients are marginal effects.				
Numbers in brackets are standard errors.				

Thus, so far our results are perfectly in line with the predictions of TCE theory: lock-in is a major determinant for vertical integration.

5.2 Robustness Checks

Let us now perform a series of robustness checks to understand whether our results are sensitive to the estimation procedure or to our variable definitions.

Table 7 shows the first set of robustness checks on various aspects of the estimation procedure underlying Table 6. Probit 5 repeats Probit 4, but imposing robust standard errors; Probit 6 clusters standard errors at the industry-country unit. The second and third column of Table 7 show the coefficients and marginal effects, respectively, when running a logit model instead of the probit model, but using the same set of covariates as in Probit 4. And finally, we fit a linear probability model to our data (OLS1). We see that medium and high lock-in remain highly significant across the different statistical models.

As a next step, let us focus on the definition of our dependent variable: Recall that any firm reporting a positive level of sales to its own parent is categorized as vertically integrated, no matter how small the firm's intra-

level for any specification except Probit 1 (the one which does not include any controls).

Table 7 - The determinants of vertical integration. Robustness Checks I: Estimation Procedure

Dependent variable: Firm is VI (extensive margin)

	Probit 5 (robust SEs)	Probit 6 (clustered SEs)	Logit 1 (robust SEs)	Logit 1′ marg. eff.	OLS 1 (robust SEs)
Lock-in low	.0124	.0124	.091	.2085	.008
	(.02333)	(.02544)	(.1583)		(.0202)
Lock-in medium	.0484**	.0484**	.323**	.3257	.039**
	(.02142)	(.02257)	(.1401)		(.0185)
Lock-in high	.0590**	.0590*	.382**	.2034	.048**
	(.02571)	(.03454)	(.1590)		(.0215)
Export share	.0006*	.0006	.004*	12.18	.001
	(.00035)	(.00043)	(.0024)		(.0004)
Firm age	-.0006	-.0006	-.004	14.02	-.001
	(.00057)	(.00072)	(.0038)		(.0006)
Constant	—	—	Yes	—	Yes
Firm size (3)	Yes	Yes	Yes	Yes	Yes
Mode of establ. (5)	Yes	Yes	Yes	Yes	Yes
Ind. x Country (208)	Yes	Yes	Yes	Yes	Yes
# of obs.	2,739	2,739	2,739		3,027
Pseudo-R^2/ R^2	0.1148	0.1148	0.1137		0.1506

*/**/*** means significant at the 10/5/1 percent level.
Reported probit coefficients are marginal effects.
Numbers in brackets are standard errors.

group sales are relative to its total sales. This is of course the most "generous" definition we can give of a vertically integrated firm, and will generate the largest possible number of such firms in our sample.

Table 8 proposes several alternative definitions of vertical integration, which differ by the threshold on intra-group sales (as percentage of total sales) that a firm has to reach to qualify as vertically integrated. Probits 7 to 10 repeat Probit 4 for a 20, 30, 70 and 80 percent threshold on the dependent variable.

Clearly, at 70 or 80 percent, we can speak of "dedicated suppliers" to their parents, and the results we find for these high thresholds complement our results from Probit 4 in an interesting way. We see that medium lock-in is no longer significant for the more dedicated suppliers, while high lock-in remains highly significant; the magnitude of the marginal effect of high lock-in remains fairly stable as well, at a level of somewhere between 4 and 6 percent.

Finally, we will explore our sample selection criteria along two dimensions: First, to be even more demanding in finding vertical integration, we require that a vertically integrated firm have not only positive sales to its parent, but that this parent must be the firm's largest shareholder, i.e. it must also qualify as a "subsidiary" in the sense that it has a largest shareholder in categories 4 or 5 of Question Q4a: This reduces our subsample of vertically integrated firms from 660 to a mere 155; under this very restric-

Table 8 - The determinants of vertical integration. Robustness Checks II: The dependent variable

	VI - extensive margin				subsidiaries	entire	startups
	$\geq$ 20%	$\geq$ 30%	$\geq$ 70%	$\geq$ 80%	only	sample	only
	Probit 7	Probit 8	Probit 9	Probit 10	Probit 11	Probit 12	Probit 13
Lock-in low	.0302	.0285	.0049	.0116	.0149	.0149*	.4256*
	(.02330)	(.02137)	(.01841)	(.01836)	(.01361)	(.00920)	(.24368)
Lock-in medium	.0383*	.0294	.0276*	.0197	.0082	.0263***	.5602***
	(.02071)	(.01886)	(.01757)	(.01650)	(.01111)	(.00818)	(.18774)
Lock-in high	.0598**	.0430**	.0446**	.0401**	.0230*	.0297***	.5100**
	(.02556)	(.02339)	(.02429)	(.02356)	(.01541)	(.00987)	(.20041)
Export share	.0008***	.0004	-.00003	.0001	.0004	.0004***	.0019
	(.00030)	(.00028)	(.00027)	(.00025)	(.00015)	(.00012)	(.00271)
Firm age	-.0009*	-.0005	-.0002	-.0002	-.0154	-.0001	—
	(.00054)	(.00047)	(.00040)	(.00037)	(.02267)	(.00019)	
Firm size (3)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mode of establ. (5)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind. x Country (208)	Yes	Yes	Yes	Yes	Yes	Yes	some
# of obs.	2,416	2,276	1,622	1,506	2,232	7,285	117
Pseudo-R^2	0.1312	0.1351	0.1523	0.1657	0.1772	0.1168	0.2192

*/**/*** means significant at the 10/5/1 percent level.
Reported probit coefficients are marginal effects.
Numbers in brackets are standard errors.

tive definition of vertical integration, almost all covariates lose significance, except for high lock-in, which remains significant, though only at 10 percent (see Probit 11).

Second, let us be less restrictive in constructing the control group for our VI firms: Rather than requiring that to qualify as VS, a firm must be independently owned, and must have sales with large domestic companies or multinationals, let us treat all firms in the sample that do not report intra-group sales as vertically separated. Probit 12 reports the results of this exercise: Our sample size more than doubles if we drop our restrictions on the VS firms, and as a result, we can estimate our coefficients much more precisely. It is therefore not surprising that medium and high lock-in are now even more significant than they were before; but most importantly, we see that our results are not driven by selection bias, i.e. by our defining criteria for the firms which are complementary to the VI firms: Even though the distribution of lock-in across VS firms differs from that of the firms excluded from the sample (see Figure 2), the impact of lock-in on vertical integration remains strongly positive even if we extend our sample to include also those firms which do not qualify as VS firms.

Finally, Probit 13 studies the same question for a very small sub-sample, namely firms which are at most 3 years old (startups). We see that even in this very small sub-sample (117 firms), the impact of lock-in on vertical integration is highly significant, and the marginal effect increases by a factor of about 10.

In Table 9, we explore in more detail the role of our main explanatory

Table 9 - The determinants of vertical integration. Robustness Checks III: The explanatory variable

	Lock-in dichot.		Lock-in at 3 levels			# comp.
	Probit 14	Probit 15	Probit 16	Probit 17	Probit 18	Probit 19
Lock-in (dummy)	.0379**	.0443***	—	—	—	—
	(.01740)	(.01580)				
Lock-in low	—	—	.0337*	.0424**	.0123	—
			(.01913)	(.01864)	(.02416)	
Lock-in high	—	—	.0579**	.0526**	.0499**	—
			(.02629)	(.02290)	(.01927)	
Nr. of competitors	—	—	—	—	—	-.0540**
						(.02134)
Export share	.0006*	.0006*	.0006*	.0006*	.0006*	.0010**
	(.00035)	(.00035)	(.00035)	(.00035)	(.00035)	(.00040)
Firm age	-.0006	-.0006	-.0006	-.0006	-.0006	-.0010
	(.00057)	(.00057)	(.00057)	(.00057)	(.00057)	(.00068)
Firm size (3)	Yes	Yes	Yes	Yes	Yes	Yes
Mode of establ. (5)	Yes	Yes	Yes	Yes	Yes	Yes
Ind. x Country (208)	Yes	Yes	Yes	Yes	Yes	Yes
# of obs.	2,739	2,739	2,739	2,739	2,739	1,800
Pseudo-R^2 / R^2	0.1135	0.1147	0.1139	0.1147	0.1148	0.1225

*/**/*** means significant at the 10/5/1 percent level.
Reported probit coefficients are marginal effects.
Numbers in brackets are standard errors.

variable, i.e. the level of lock-in. Recall that firms could report four different levels of lock-in, from non-existent to high, and that our baseline specification therefore included three dummies which correspond to three out of the four possible categories, namely low, medium, and high lock-in. Let us now redefine lock-in as a dichotomous variable: In Probit 14, lock-in takes value 1 if the firm reports any positive level of lock-in (low, medium, or high); in Probit 15, lock-in is defined in a more restrictive way, taking value 1 only if the firm reported at least a medium level of lock-in, while those reporting low lock-in are assigned value zero.

Next, we also consider the possibility of redefining lock-in at 3 levels rather than 4, so that lock-in can be either non-existent, low or high. To do this, we have to lump two categories of the original data into one single level of the new variable: Probit 16 shows results when low and medium lock-in are reclassified as "low"; Probit 17 shows the case where firms reporting no or low lock-in are pooled into the "no lock-in" category; and Probit 18 shows results for the case where the medium and high level reports are both classified as "high". This exercise again confirms that it is the medium and high lock-in levels that drive vertical integration.

Finally, in Probit 19 of Table 9, we replace our measure of lock-in (Q11) with a different measure of supplier substitutability, namely the number of competitors in the national market the establishment currently faces for its

main product line or service (Question Q12ba).[12] Firms could respond to this question by either "none" (value 1), "1 to 3" (value 2), or "4 or more" (value 3). As we can see, the number of competitors has a strong negative impact on the level of vertical integration. This is again in line with our hypothesis that lack of supplier substitution (i.e. lack of competition on the seller side of the market) is associated with higher levels of vertical integration.

5.3 Further Results on Lock-in and Vertical Integration

In this section, we will explore the impact of various important firm characteristics on the role of lock-in at the extensive margin, and we will study the impact of lock-in at the intensive margin of vertical integration.

Table 10 reports regression results when interacting the three lock-in variables one by one with four specific firm characteristics: "young" refers to a firm founded from 1990 onwards, "exporters" indicates a firm that has positive exports, "large" refers to a firm having at least 250 employees, and "Non manuf." indicates a firm operating in any sector other than manufacturing. This approach allows us to purge the coefficients on lock-in from possible confounding factors stemming from our specific sample composition: The firms in our sample are heterogenous with respect to a number of characteristics, in particular their age, size, exporting status, and industry.

The focus on "young" firms is motivated by the important structural break that the year 1989 represents for all transition economies; exporters are singled out because they may be affiliates to a foreign multinational, and therefore not report any intra-group sales under Q9 although they are in fact vertically integrated (recall that Q9 only accounts for *domestic* sales, not exports, to parents or their subsidiaries); large firms may react differently to the risks of hold-up than small firms because they tend to have more bargaining power in any bilateral exchange; and finally, the available evidence on the TCE theory typically focuses on firms in the manufacturing sector, while our dataset is one of the few that allows us to verify the outside validity of these findings towards other sectors in the economy.

Probit 20 shows that the interaction terms for young firms are not significant, indicating that there is no differential impact of lock-in on vertical integration for young firms as opposed for older firms (in particular, firms founded before the fall of the Iron Curtain). Being an exporter significantly reduces the impact of lock-in for very high levels of the latter (Probit 21). Being a large firm raises the probability of being vertically integrated significantly in itself, but does not alter the impact of lock-in on the probability of carrying out intra-group sales (Probit 22). Instead, operating in a non-manufacturing industry significantly reduces the probability of vertical in-

[12] See also Caves and Bradburd (1988) and Ohanian (1994) in using small-numbers bargaining as a proxy for lock-in

Table 10 - The determinants of vertical integration: The role of lock-in for different subgroups of firms

Dependent variable: Firm is VI (extensive margin)				
	Young	Exporters	Large	Non manuf.
	Probit 20	Probit 21	Probit 22	Probit 23
Lock-in low	.0278	.0372	.0214	.0080
	(.05458)	(.03250)	(.0261)	(.03346)
Lock-in medium	.1039**	.0458*	.0529**	.0817***
	(.04936)	(.02835)	(.02367)	(.03123)
Lock-in high	.1067**	.1083***	.0728***	.1115***
	(.05875)	(.03528)	(.02815)	(.03874)
IT[1)]	.0222	.0433	.1920***	-.9430***
	(.04288)	(.03798)	(.07181)	(.09597)
Lock-in low*IT	-.0188	-.0548	-.0665	.0098
	(.05543)	(.03882)	(.05366)	(.04860)
Lock-in medium*IT	-.0618	.0023	-.0407	-.0612
	(.0444)	(.04198)	(.05296)	(.03499)
Lock-in high*IT	-.0499	-.0942**	-.1012*	-.0842**
	(.04807)	(.03119)	(.04404)	(.0597)
Export share	Yes	Yes	Yes	Yes
Firm age	Yes	Yes	Yes	Yes
Firm size (3)	Yes	Yes	Yes	Yes
Mode of establ. (5)	Yes	Yes	Yes	Yes
Ind. x Country (208)	Yes	Yes	Yes	Yes
# of obs.	2,739	2,739	2,739	2,739
Pseudo-R^2 / R^2	0.1157	0.1181	0.1159	0.1174

*/**/*** means significant at the 10/5/1 percent level.
[1)] "IT" stands for "young" in Probit 18, "exporters" in Probit 19, etc.
Reported probit coefficients are marginal effects.
Numbers in brackets are standard errors.

Table 11 - The determinants of vertical integration - the intensive margin.

Dependent variable: Intra-group sales as % of total sales (0 - 100)					
	OLS 2 (true values)	OLS 3 (winsorized)	Poisson 1 (10 bins)	Ordered Probit 1 (10)	Ordered Probit 2 (100)
Lock-in low	1.131	.9165	.1687**	.0755	.0796
	(1.1542)	(.86426)	(.06650)	(.08594)	(.08584)
Lock-in medium	1.456	1.223	.2399***	.1750**	.1707**
	(1.0368)	(.77984)	(.05992)	(.07671)	(.07667)
Lock-in high	2.415**	1.831**	.3128***	.2234**	.2245***
	(1.1774)	(.89895)	(.06685)	.(08635)	.08627
Export share	.019	.0194	.0023**	.0024*	.0024*
	(.0185)	(.0165)	(.00095)	(.00126)	(.00126)
Firm age	-.035	-.0325	-.0024	-.0022	-.0020
	(.0313)	(.02868)	(.00150)	(.00210)	(.00209)
Firm size (3)	Yes	Yes	Yes	Yes	Yes
Mode of establ. (5)	Yes	Yes	Yes	Yes	Yes
Ind. x Country (208)	Yes	Yes	Yes	Yes	Yes
# of obs.	3,027	3,027	3,027	3,027	3,027
Pseudo-R^2/ R^2	0.1483	0.1487	0.1920	0.0890	0.0764
*/**/*** means significant at the 10/5/1 percent level.					
Reported probit coefficients are marginal effects.					
Numbers in brackets are standard errors.					

tegration, and also reduces the impact of high lock-in on the probability of having positive sales with a parent (Probit 23).[13]

Finally, let us study the impact of lock-in on vertical integration at the intensive margin, i.e. on the share of intra-group sales in a firm's overall sales. To this end, we use the continuous measure of intra-group sales as given by the responses to question Q9d, rather than the dichotomous variables used so far.

Table 11 shows results for different statistical models, using the same covariates as in our baseline regression Probit 4, but now studying their impact on the intensive margin of vertical integration. OLS 2 shows results for an OLS regression on the values for intra-group sales as reported by the firms. To make sure results are not driven by outliers, we repeat regression OLS 2 on the winsorized data for intra-group sales, i.e. replacing the lowest and highest values for intra-group sales by the value corresponding to the 5th and 95th percentile, respectively. We see that this reduces the level of

[13] See Section 2 regarding the industry-specific evidence we have on TCE (automobile components (Monteverde and Teece (1982)), aerospace industry (Masten (1984)), electricity generation (Joskow, 1985, Saussier, 2000), aluminum (Stuckey, 1983; Hennart, 1988), forestry (Globerman and Schwindt, 1986), chemicals (Lieberman, 1991), engineering (Lyons, 1995), trucking (Nickerson and Silverman, 2003, Baker and Hubbard, 2003, 2004), offshore oil gathering (Hallwood, 1991), information technology (Ulset, 1996), electronic components (Weiss and Kurland, 1997), construction (González-Diaz, Arruñada, and Fernández, 2000), and even stock exchanges (Bindseil, 1997)) None of these studies allows us to confront the importance of lock-in for vertical integration across industries, as we do here.

the coefficient somewhat, but high lock-in remains highly significant even under the winsorized dependent variable.

OLS may be considered an inappropriate statistical model for our dependent variable, which runs in integers from 0 to 100, and has positive mass on zero, on the multiples of 10, i.e. 10, 20, 30 etc, and on focal levels such as 15, 25 and 75. We therefore apply two specifications which are more appropriate for count variables, namely the Poisson model and an ordered probit. The Poisson model is run on a 10-level scale constructed from the original data by assigning all values from 0 to 10 to bin 1, from 11 to 20 to bin 2 etc., while the ordered probit is carried out both for the 10 step scale and for the original 100-step scale given by the true data. We see that both in Poisson 1 and in the two ordered probits, the presence of either medium or high lock-in raises the level of intra-group sales significantly. This shows that lock-in not only affects the decision of whether or not to have intra-group sales at all, but also on how much of your productive capacity to dedicate to the parent firm.

6 Conclusion

The purpose of this paper was to tap a new dataset, the BEEPS 2005 Survey carried out by the European Bank for Reconstruction and Development and the World Bank, for the empirical analysis of TCE theory. Based on some 3,300 establishments located in 27 Eastern European and Central Asian countries, I test the key prediction of TCE theory, namely that more lock-in should make vertical integration more likely.

This prediction is very clearly borne out in the data: At the extensive margin, a firm whose customers are locked-in at medium or high levels is about 5 to 6 percent more likely to be vertically integrated with its customer than a firm whose customers are not locked-in. At the intensive margin, I find that high lock-in raises intra-group sales by about 2 percentage points.

This results deepens our understanding of the driving forces behind corporate structures along several lines: First of all, this paper documents a number of stylized facts for vertical relations transition economies that have only been studied for highly developed economies so far, such as the wide dispersion of intra-group sales among vertically integrated structures, with dedicated suppliers (having more than, say, 70 percent of their sales to their parent) being a small minority among the vertically integrated firms (see Atalay et al, 2014). Most importantly, however, this is the first paper to test the predictions of TCE in the context of transition economies.

Historically, interest in the policy implications of TCE has been strongest in the area of antitrust and regulation.[14] Recall that the neoclassical view of

[14] See Bell (2010), and Macher and Richman (2008) for an overview of the literature applying TCE to public policy issues; Williamson's (1976) work on cable TV services in California

vertical restraints in general, and vertical integration in particular, i.e. any governance structure that deviates from spot markets, was that of a mechanisms for the enhancement and exploitation of market power. From a public policy point of view, the main interest in TCE is therefore to allow antitrust authorities to distinguish between contractual provisions most likely used to enhance market power (which is illegal) and those most likely used to promote economic efficiency (which is not illegal, can be used as a defense in an antitrust case, and in general should be encouraged).

With the introduction of the so called "economic approach" into competition policy in many jurisdictions (including the European Union, to which many CEE countries now belong), this exercise has become crucial in the substantive analysis of vertical mergers, which run through the same approval process as any other merger.[15] Weighing the potential pro and anticompetitive effects of vertical integration is a particularly delicate exercise in an environment like the CEE countries where state-guided contract enforcement is often under-provided, so that alternative governance mechanisms such as long-run supply contracts, which heavily rely on an efficient judicial system, may be less feasible than they are in other parts of the European Union.

My results indicate that in CEE, the lack of supplier substitutability still is a major driving force behind vertical integration, even if we control for each country's particular legal environment (i.e. controlling for country fixed effects); antitrust authorities should therefore carefully examine the potential implications of any given vertical merger on the competitiveness of the industry in which it arises, rather than relying on the presumption that such mergers arise naturally out of a need to compensate for the insufficient legal infrastructure in the CEE countries.

[15] See also Mullin and Mullin (1997) for an interesting application of this approach to the ex-post evaluation of the famous antitrust case of United States Steel's acquisition of the Great Northern Ore Properties.

References

Allen, J. W., Phillips, G. M., 2000. Corporate Equity Ownership, Strategic Alliances, and Product Market Relationships. Journal of Finance 55, 2791–2815.

Anderson, E., Schmittlein, D. C., 1984. Integration of the Sales Force: An Empirical Examination. Rand Journal of Economics 15, 385–395.

Atalay, E., Hortaçsu A., Syverson, C., 2014. Vertical Integration and Input Flows. American Economic Review 104, 1120–1148.

Baker, G. P., Hubbard T. N., 2003. Make Versus Buy in Trucking: Asset Ownership, Job Design, and Information. American Economic Review, 93(3), 551–572.

Baker, G. P., Hubbard T. N., 2004. Contractibility And Asset Ownership: Onboard Computers And Governance In U.S. Trucking. Quarterly Journal of Economics 119, 1443–1479.

Bell, C. R., 2010. Transaction Cost Economics. In: Free, R. C. (Ed.), 21st Century Economics: A Reference Handbook, vol. 1. Sage Publications, Los Angeles, pp. 193–202.

Bernard, A. B. , Jensen J. B., Schott P. K., 2006. Transfer Pricing by U.S.-Based Multinational Firms. NBER Working Paper No. 12493.

Bigelow, L., 2001. Efficient Alignment and Survival in the U.S. Automobile Industry. Working Paper, Olin School of Business, Washington University, St. Louis.

Bindseil, U., 1997. Vertical Integration in the Long Run: The Provision of Physical Assets to the London and New York Stock Exchanges. Journal of Institutional and Theoretical Economics 153, 641–56.

Blanchard, O., 1993. Reform in Eastern Europe. MIT press, Boston.

Boone, A., 2003. The Interaction of Ownership, Governance, and Product Markets: Evidence from Equity Carve-outs. mimeo.

Braconier, H., Ekholm, K., 2001. Foreign Direct Investment in Central and Eastern Europe: Employment Effects in the EU. CEPR Discussion Paper No. 3052.

Brenton, P., di Mauro, F., Lücke, M., 1999. An Empirical Analysis of Foreign Investment in the EU and in Central and Eastern Europe. Empirica 26, 95–121.

Brouthers, K. .D, Brouthers, L. E., Werner, S., 2001. R&D mode choices in Central and Eastern Europe. Journal of Business Research 52, 83–91.

Carlin, W., Mayer, C., Sinn H.-W., Grilli, V., 1992. Restructuring Enterprises in Eastern Europe. Economic Policy 7, 311–352.

Caves, R. E., Bradburd, R. E., 1988. The Empirical Determinants of Vertical Integration. Journal of Economic Behavior and Organization 9, 265–279.

Chiappori, P. A., Salanié, B., 2002. Testing Contract Theory: A Survey of Some Recent Work. CESifo Working Paper No. 738.

Choi, J. P., Ghosh A., Niu, S., Morita, H., 2014. Vertical learning alliances and partial equity ownership in the presence of performance spillovers. mimeo.

Coase, R. H., 1937. The Nature of the Firm. Economica, New Series 4, 386–405.

Crocker, K. J., Reynolds, K. J., 1993. The Efficiency of Incomplete Contracts: An Empirical Analysis of Air Force Engine Procurement. Rand Journal of Economics 24, 126–146.

Cuyvers, L., Dumont, M., Rayp, G., Stevens, K., 2005. Home Employment Effects of EU Firms' Activities in Central and Eastern European Countries. Open Economies Review 16, 153–174.

Delios, A.,Henisz, W. J., 2000. Japanese Firms' Investment Strategies in Emerging Economies. The Academy of Management Journal 43, 305–323.

Dries, L., Germenji E., Noev, N., Swinnen, J. F.M., 2009. Farmers, Vertical Coordination, and the Restructuring of Dairy Supply Chains in Central and Eastern Europe. World Development 37, 1742–1758.

Dries, L., Swinnen, J. F.M., 2004. Foreign Direct Investment, Vertical Integration, and Local Suppliers: Evidence from the Polish Dairy Sector. World Development 32, 1525–1544.

Flath, D., 1989. Vertical integration by means of shareholding interlocks. International Journal of Industrial Organization 7, 369–380.

Fons-Rosen, C., Kalemli-Ozcan, S., Sørensen, B. E., Villegas-Sanchez, C., Volosovych, V., 2013. Quantifying Productivity Gains from Foreign Investment. mimeo.

Forbes, S. J., Lederman, M., 2009. Adaptation and Vertical Integration in the Airline Industry. American Economic Review 99, 1831–1849.

Foros, Ø., Kind, H. J., Shaffer, G., 2011. Mergers and partial ownership. European Economic Review 55, 916–926.

Globerman, S., Schwindt, R., 1986. The Organization of Vertically Related Transactions in the Canadian Forest Products Industries. Journal of Economic Behavior and Organization 7, 199–212.

Gonçalves, R., 2013. Backward partial vertical integration with discriminatory pricing. mimeo.

González-Diaz, M., Arruñada, B., Fernández A., 2000. Causes of Subcontracting: Evidence from Panel Data on Construction Firms. Journal of Economic Behavior and Organization 42, 167–187.

Goolsbee, A., 2007. Vertical Integration and the Market for Broadcast and Cable Television Programming. Report commissioned by the Federal Communications Commission, https,//apps.fcc.gov/edocs_public/attachmatch/DA-07-3470A10.pdf.

Gow, H. R., Swinnen, J. F. M. , 1998. Up- and downstream restructuring, foreign direct investment, and hold-up problems in agricultural transition. European Review of Agricultural Economics 25, 331–350.

Greenlee, P., Raskovich, A., 2006. Partial vertical ownership. European Economic Review 50, 1017–1041.

Grossman, S. J., Hart, O. D., 1986. The Costs and Benefits of Ownership: A Theory of Vertical Integration. Journal of Political Economy 94, 691–719.

Hallwood, P. C., 1991. On Choosing Organizational Arrangements: The Example of Offshore Oil Gathering. Scottish Journal of Political Economy 38, 227–241.

Harrigan, K. R., 1986. Matching Vertical Integration Strategies to Competitive Conditions. Strategic Management Journal 7, 535–555.

Hennart, J.-F., 1988. Upstream Vertical Integration in the Aluminum and Tin Industries. Journal of Economic Behavior and Organization 9, 281–299.

Hoekman, B., Djankov, S., 1996. Intra-Industry Trade, Foreign Direct Investment, and the Reorientation of Eastern European Exports. World Bank Policy Research working paper No. 1652.

Hubbard, T. N., 1999. How Wide is the Scope of Hold-Up Based Theories of Governance? Shipper–Carrier Relations in Trucking.Working Paper, Department of Economics, UCLA.

Joskow, P. L., 1985. Vertical Integration and Long-Term Contracts: The Case of Coal-Burning Electric Generation Plants. Journal of Law, Economics, and Organization 1, 33–80.

Joskow, P. L., 2005. Vertical Integration. In: Menard, C., Shirley, M. M. (Eds.), Handbook of New Institutional Economics, Springer US, pp. 319–348.

Jovanovic, D., Wey, C., 2013. Passive Partial Ownership, Sneaky Takeovers, and Merger Control. mimeo.

Jude, C., Pop Silaghi, M. I., 2016. Employment effects of foreign direct investment: New evidence from Central and Eastern European countries. International Economics 145, 32–49.

Hellman, J. S., Jones, G., Kaufmann, D., Schankerman, M., 2000. Measuring Governance, Corruption, and State Capture: How Firms and Bureaucrats Shape the Business Environment in Transition Economies. World Bank Policy Research Working Paper 2312, April 2000.

Kang, J.-.K, 1993. The international market for corporate control: Mergers and acquisitions of U.S. firms by Japanese firms. Journal of Financial Economics 34, 345–371.

Klein, P. G., 2005. The Make-or-Buy Decision: Lessons from Empirical Studies. In: Menard, C., Shirley, M. M., (Eds.), Handbook of New Institutional Economics, Springer US, p. 435–464.

Lafontaine, F., Shaw, K., 1999. The Dynamics of Franchise Contracting: Evidence from Panel Data. Journal of Political Economy 107, 1041–1080.

Levy, D., 1985. The Transaction Cost Approach to Vertical Integration: An Empirical Examination. Review of Economics and Statistics 67, 438–445.

Levy, N., Spiegel, Y., Gilo, D., 2015. Partial Vertical Integration, Ownership Structure and Foreclosure. mimeo.

Lieberman, M. B., 1991. Determinants of Vertical Integration: An Empirical Test. Journal of Industrial Economics 39, 451–466.

Lyons, B. R., 1995. Specific Investment, Economies of Scale, and the Make-or-Buy Decision: A Test of Transaction Cost Theory. Journal of Economic Behavior and Organization 26, 431–443.

Macher, J. T., Richman, B. D., 2008. Transaction Cost Economics: An Assessment of Empirical Research in the Social Sciences. Business and Politics 10(1).

MacMillan, I. C., Hambrick, D. C. , Pennings, J. M., 1986. Uncertainty Reduction and the Threat of Supplier Retaliation: Two Views of the Backward Integration Decision. Organization Studies 7, 263–278.

Masten, S. E., 1984. The Organization of Production: Evidence from the Aerospace Industry. Journal of Law and Economics 27, 403–417.

Masten, S. E., Meehan, J. W., Snyder, E. A., 1991. The Costs of Organization. Journal of Law, Economics and Organization 7, 1–25.

Masters, J. K., Miles, G., 2002. Predicting the Use of External Labor Arrangements: A Test of the Transaction Cost Perspective. Academy of Management Journal 45, 431–42.

McMillan, J., Woodruff, C., 1999. Interfirm Relationships And Informal Credit In Vietnam. The Quarterly Journal of Economics 114, 1285–1320.

Monteverde, K., Teece, D. J., 1982. Supplier Switching Costs and Vertical Integration in the Automobile Industry. Bell Journal of Economics 13, 206–213.

Mullin, J. C., Mullin, W. R., 1997. United States Steel's acquisition of the Great Northern Ore properties: Vertical foreclosure or efficient contractual governance? Journal of Law, Economics, and Organization 13, 74–100.

Nickerson, J. A., Silverman, B. S., 2003. Why Aren't All Truck Drivers Owner-Operators? Asset Ownership and the Employment Relation in Interstate For-Hire Trucking. Journal of Economics and Management Strategy 12, 91–118.

Ohanian, N. K., 1994. Vertical Integration in the U.S. Pulp and Paper Industry, 1900–1940. Review of Economics and Statistics 74, 202–207.

Pavlínek, P., 2004. Regional Development Implications of Foreign Direct Investment in Central Europe. European Urban and Regional Studies 11, 47–70.

Pirrong, S. C., 1993. Contracting Practices in Bulk Shipping Markets: A Transactions Cost Explanation. Journal of Law and Economics 36, 937–976.

Salop, S. C., O'Brien, D. P., 2000. Competitive Effects of Partial Ownership, Financial Interest and Corporate Control. Antitrust Law Journal 67, 559–614.

Saussier, S., 2000. Transaction Costs and Contractual Incompleteness: The Case of Electricité de France. Journal of Economic Behavior and Organization 42, 189–206.

Serbera, J. P., 2011. Partial horizontal and vertical ownership. Applied Economics Letters 18, 531–537.

Spiller, P., 1985. On Vertical Mergers. Journal of Law, Economics and Organization 1, 285–312.

Stuckey, J., 1983. Vertical Integration and Joint Ventures in the Aluminum Industry. Cambridge, Mass., Harvard University Press.

Swinnen, J. F. M., 2002. Transition and Integration in Europe: Implications for agricultural and food markets, policy, and trade agreements. The World Economy 25, 481–501.

Tirole, J., 1991. Privatization in Eastern Europe, Incentives and the Economics of Transition. In: Blanchard, O. J., Fischer, S. (Eds.), NBER Macroeconomics Annual 1991, vol. 6. MIT Press, Boston, pp. 221–268.

Uhlenbruck, K., De Castro, J. O., 2000. Foreign Acquisitions in Central and Eastern Europe: Outcomes of Privatization in Transitional Economies. Academy of Management Journal 43, 381–402.

Uhlenbruck, K., Meyer, K. E., Hitt, M. A., 2003. Organizational Transformation in Transition Economies: Resource-based and Organizational Learning Perspectives. Journal of Management Studies 40, 257–282.

Ulset, S., 1996. R&D Outsourcing and Contractual Governance: An Empirical Study of Commercial R&DProjects. Journal of Economic Behavior and Organization 30, 63–82.

Walker, G., Weber, D., 1984. A Transaction Cost Approach to Make-or-Buy Decisions. Administrative Science Quarterly 29, 373–391.

Waterman, D., Weiss, A. A., 1997. Vertical Integration in Cable Television. MIT Press, Cambridge, MA, and AEI Press, Washington, DC.

Weiss, A. M., Kurland, N., 1997. Holding Distribution Channel Relationships Together: The Role of Transaction-Specific Assets and Length of Prior Relationships. Organization Science 8, 612–623.

Whinston, M. D., 2003. On the Transaction Cost Determinants of Vertical Integration. Journal of Law, Economics, and Organization 19, 1–23.

Williamson, O. E., 1975. Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization. Free Press, New York.

Williamson, O. E., 1976. Franchise Bidding for Natural Monopolies - In General and with Respect to CATV. Bell Journal of Economics 7, 73–104.

Williamson, O. E., 1985. The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting. Free Press, New York.

Williamson, O. E., 1996. The Mechanisms of Governance, Oxford University Press, Oxford, UK.

7 Appendix - Figures

Figure 3 - Distribution of Annual Sales

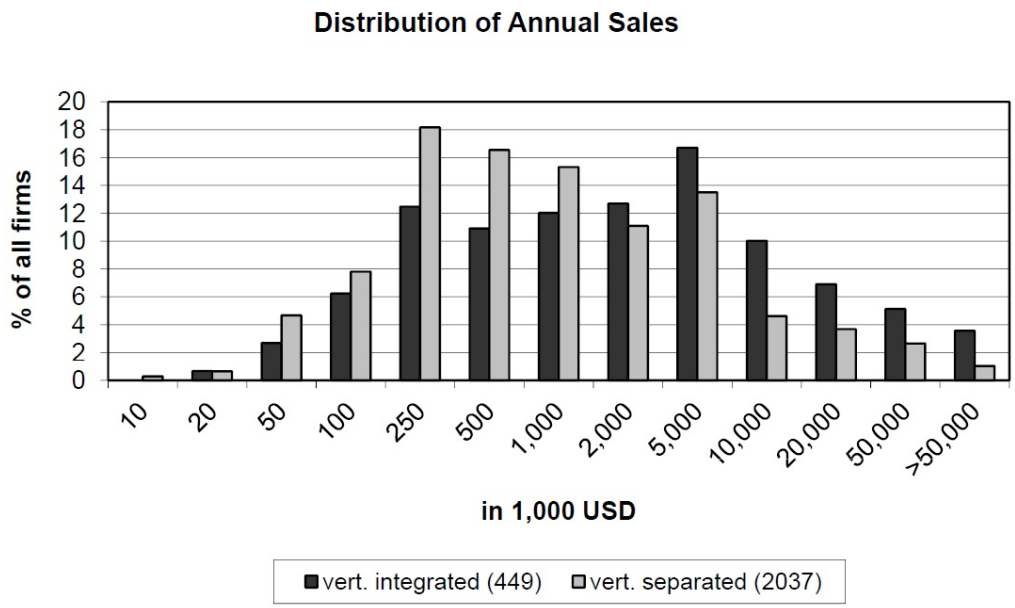


Figure 4 - Distribution of Annual Sales

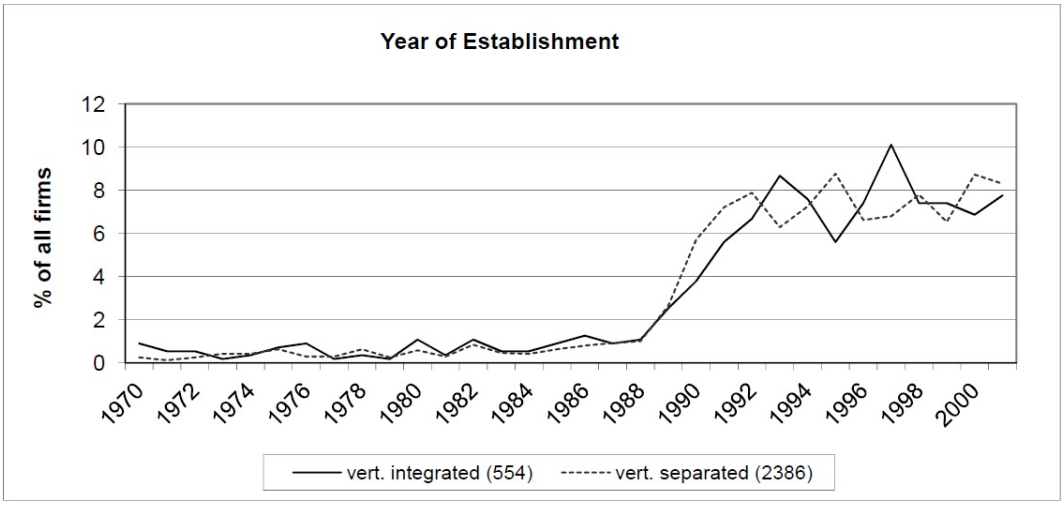


Figure 5 - Histogram of export shares for VI and VS firms

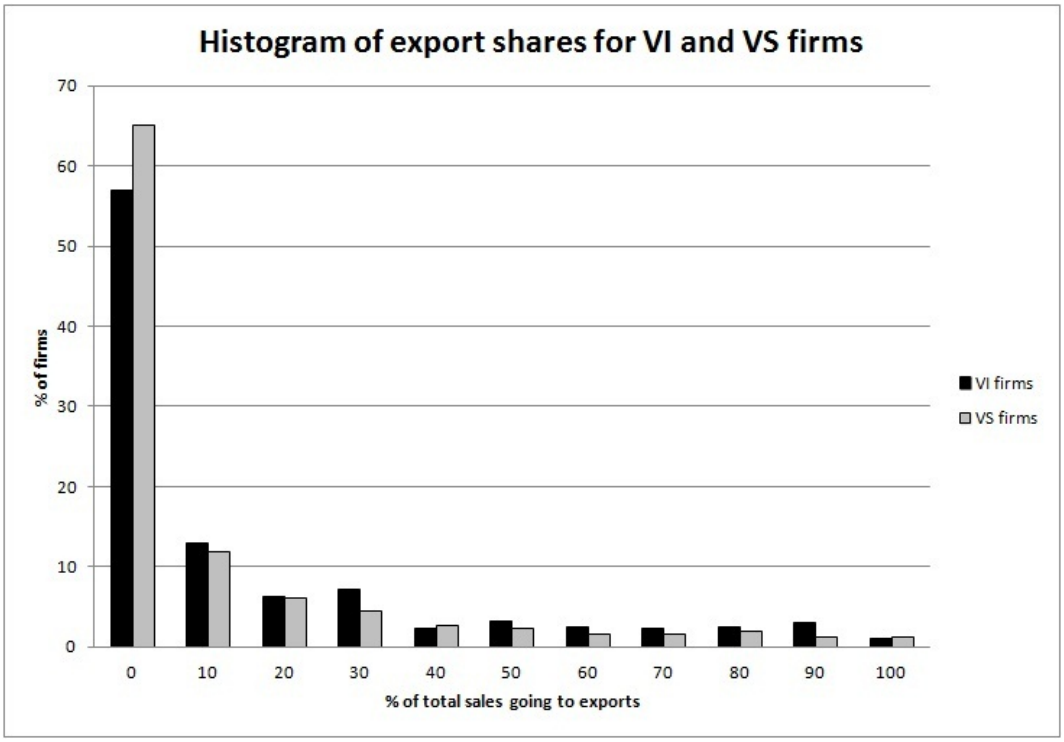


Figure 6 - Number of full-time employees

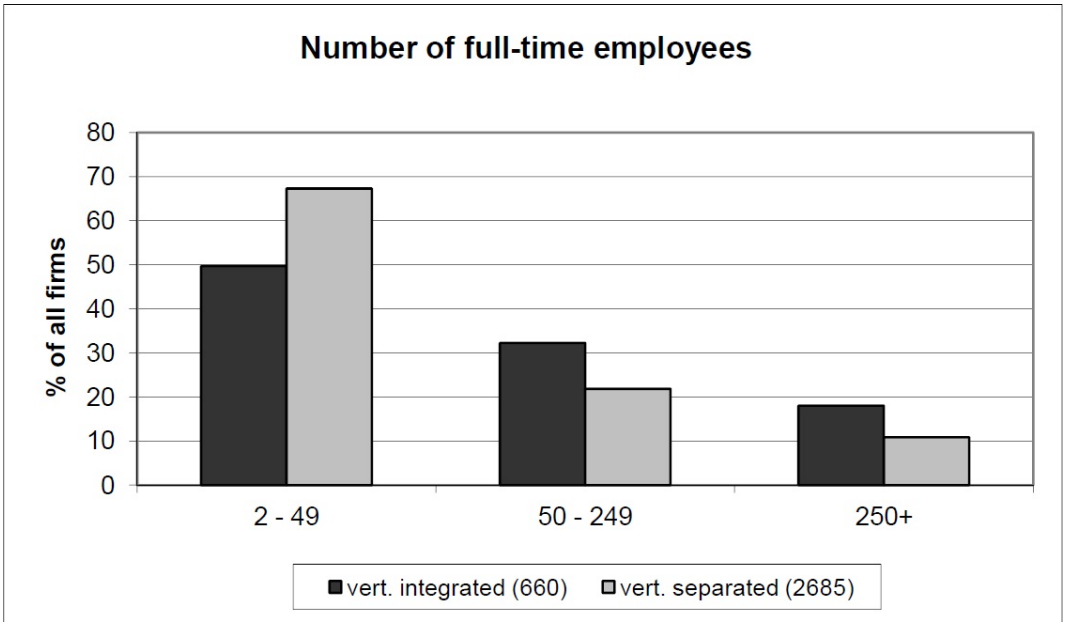


Figure 7 - How was the company established?

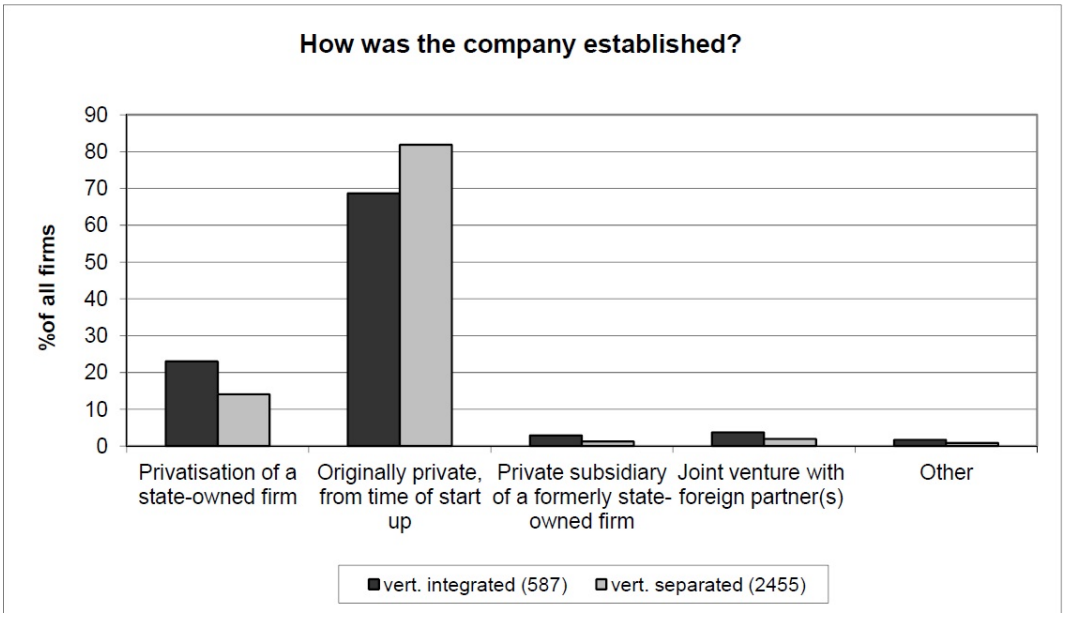


Figure 8 - Integrated and Separated Firms by Industry

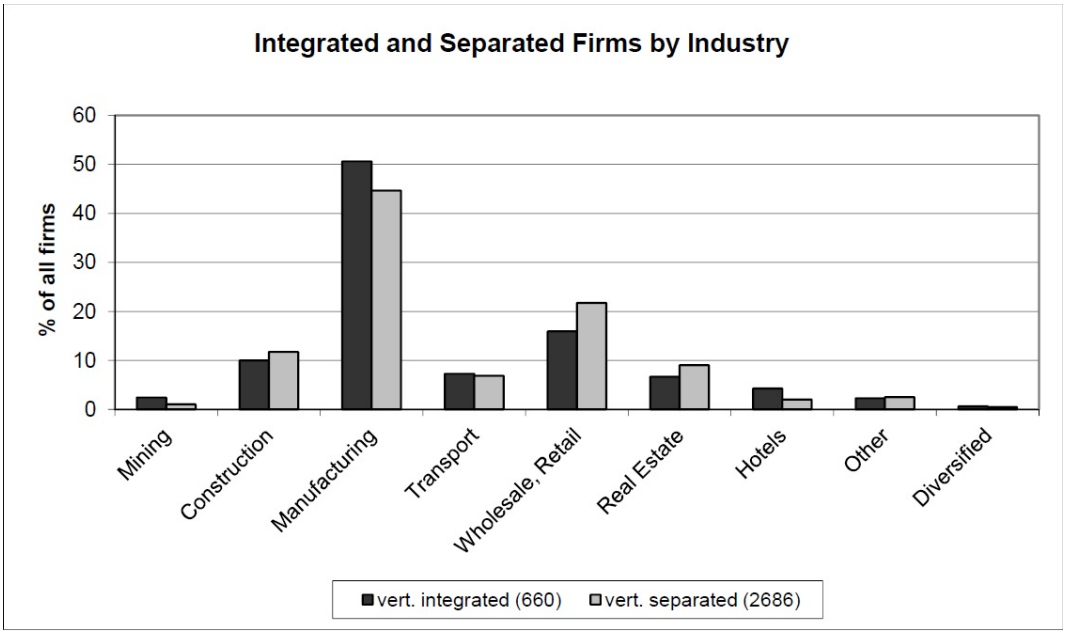


Figure 9 - Distribution of firms across countries

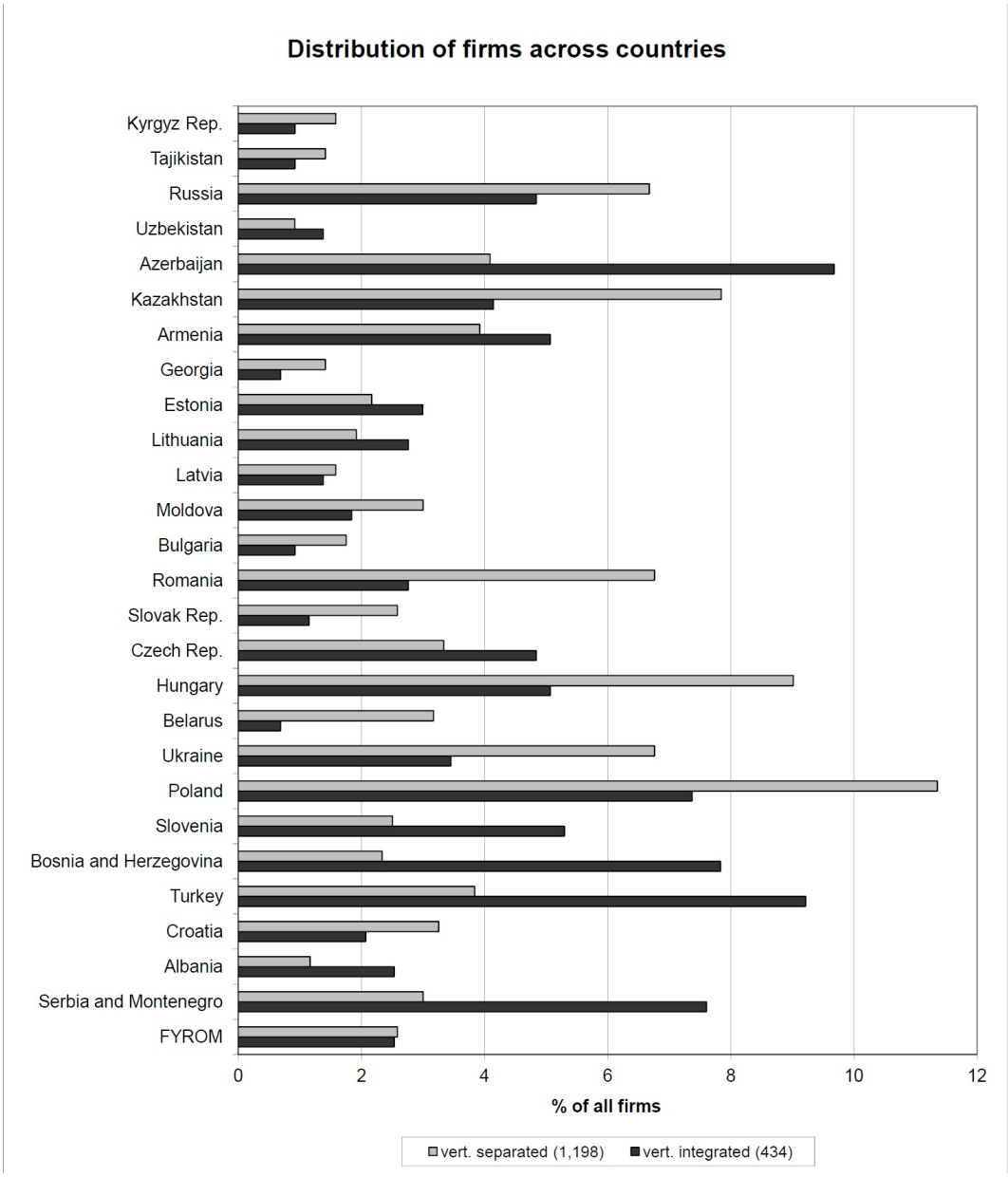


Figure 10 - CDF of intra-group sales, by degree of lock-in