

Friesenbichler, Klaus S.

Working Paper

EU Accession, Domestic Market Competition and Total Factor Productivity. Firm Level Evidence

WIFO Working Papers, No. 492

Provided in Cooperation with:

Austrian Institute of Economic Research (WIFO), Vienna

Suggested Citation: Friesenbichler, Klaus S. (2014) : EU Accession, Domestic Market Competition and Total Factor Productivity. Firm Level Evidence, WIFO Working Papers, No. 492, Austrian Institute of Economic Research (WIFO), Vienna

This Version is available at:

<https://hdl.handle.net/10419/129041>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

**EU Accession, Domestic Market
Competition and Total Factor
Productivity**

Firm Level Evidence

Klaus S. Friesenbichler



EU Accession, Domestic Market Competition and Total Factor Productivity

Firm Level Evidence

Klaus S. Friesenbichler

WIFO Working Papers, No. 492

December 2014

Abstract

In this paper we argue that changes in the EU membership status of the countries in Central and Eastern Europe led to less concentrated markets. This is due to the implementation of competition policy and other pro-competitive policies embedded in the Community Acquis, the body of European Union law. A regression analysis using data on 39,646 firms from six survey waves between 2002 and 2013 found EU membership to significantly increase the degree of domestic competition. While the effect of competition policy itself on market structures was statistically insignificant, the interaction between EU membership status and competition policy showed a strong and statistically significant competition enhancing effect. These findings were linked to a firm-level TFP analysis. Less concentrated markets were associated with higher productivity levels. This finding is robust after controlling for endogeneity issues. EU membership was only weakly associated with changes in TFP levels, but led to a decrease in the variance of the productivity measure across firms.

E-mail address: Klaus.Friesenbichler@wifo.ac.at
2014/507/W/O

© 2014 Österreichisches Institut für Wirtschaftsforschung

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • 1030 Wien, Arsenal, Objekt 20 • Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 • <http://www.wifo.ac.at/> • Verlags- und Herstellungsort: Wien

Die Working Papers geben nicht notwendigerweise die Meinung des WIFO wieder

Kostenloser Download: <http://www.wifo.ac.at/wpa/pubid/50884>

EU-accession, domestic market competition and total factor productivity: Firm level evidence

Klaus S. Friesenbichler

Klaus.Friesenbichler@wifo.ac.at

Austrian Institute of Economic Research (WIFO)

1030 Wien, Arsenal, Objekt 20

+43-1-7982601-296

Abstract

In this paper we argue that changes in the EU-membership status of the countries in Central and Eastern Europe led to less concentrated markets. This is due to the implementation of competition policy and other pro-competitive policies embedded in the Community Acquis, the body of European Union law. A regression analysis using data on 39,646 firms from six survey waves between 2002 and 2013 found EU-membership to significantly increase the degree of domestic competition. While the effect of competition policy itself on market structures was statistically insignificant, the interaction between EU-membership status and competition policy showed a strong and statistically significant competition enhancing effect. These findings were linked to a firm-level TFP analysis. Less concentrated markets were associated with higher productivity levels. This finding is robust after controlling for endogeneity issues. EU-membership was only weakly associated with changes in TFP levels, but led to a decrease in the variance of the productivity measure across firms.

JEL Classifications: K21, L22, L25, L53, O52

Keywords: competition policy, productivity, Community Acquis, EU, Enterprise Surveys, ECA, CEE.

EU-accession, domestic market competition and total factor productivity: Firm level evidence

0. Introduction

A quarter century ago, the communist regimes in Eastern Europe and Central Asia started their economic transition to a market-based economy. The pivotal element was the abandonment of economic planning. The fundamental difference between economic planning and market economies is the difference in the identification method of demand. While being satisfied in a top-down fashion in economic planning, market based economies use competitive allocation mechanisms. Hence, market based allocation is the antithesis to economic planning. The degree to which an economy has overcome the inefficiencies of economic planning is mirrored by how competitive the market selection is. This is relevant due to the macro-economic performance variance among the transition economies. While the transition has been largely completed in Central and Eastern European countries, the countries of the Commonwealth of Independent States seem to be lagging (Havrylshyn, 2013), which is also mirrored by firm and industry performance (Münich and Svejnar, 2007). The transition to market based economies was policy driven. Especially the prospect to join the European Union (EU) has spurred institutional reforms in many transition countries, encouraging trade and FDI, firm turnover and the restructuring of state owned enterprises (Kornai, 1992, Bevan and Estrin, 2000; Clarke, 2011; Boeheim and Friesenbichler, 2014).

This study examines whether changes to the EU-membership affected market structures, and thereby the degree of domestic competition that firms face. It explores if competition policy served as a channel to create a level playing field for firms, and if more competition led to higher firm-level productivity. The main data source is Enterprise Survey data provided by the World Bank, covering 39,646 establishments for six survey waves in the period 2002 to 2013. Firms in CEE countries that changed their EU membership status constitute the treatment group. Other low and middle income countries of Eastern Europe and Central Asia that departed from similar points in their transition processes serve as a control group. The findings indicate that firms in economies that joined the EU were facing more competition, especially when EU-membership was accompanied by stricter competition policies. The change toward more competitive market structures positively affected total factor productivity at the firm level.

This research adds to the literature in various ways. The impact of competition policy on market structures and its efficiency enhancing effect through the deterrence effect on firms' anticompetitive behaviour is not comprehensively researched for developing countries. While several studies assess the effectiveness of competition policy in industrial nations (e.g., Buccirosi et. al., 2011; Voigt, 2009; Nicholson, 2008, Hoj, 2007), firm level evidence on transition economies is rare and typically has a focus on internationalisation processes (Ospina and Schiffbauer, 2010; Clarke, 2011). The effect of policies on domestic competition is under-researched. Firm level evidence against the background of EU-enlargements is lacking altogether. This is insofar surprising, as the EU-membership induced fundamental changes in the regulatory environment that affect firm behaviour and firm productivity alike, which again has implications on aggregate productivity. This evidence is of practical relevance to policy makers whose countries are 'stuck in transition' (EBRD, 2013), and to policy makers that face the choice of pursuing EU-membership or not.

The remainder is organised as follows. The next section provides a brief literature survey about the determinants of market structure, the policies embedded in the Community Acquis and how competition links to firm-level productivity. This review is used to develop three hypotheses tested in this paper. Section II describes the data and variables. Section III presents the estimation strategy and discusses the empirical results, before the final section summarises and concludes the findings.

1. Market structure and the Community Acquis

To analyse the role of policies, we first need to establish the determinants market structures. This section provides a brief literature survey that is used to develop the hypotheses tested in this study. The review is structured into three parts. The first subsection sketches micro-economic explanations of domestic inter-firm competition with a special focus on transition economies, which is used to justify the control variables in the regression analysis of this paper. The second part elaborates on the interaction between market structures and the pro-competitive policies embedded in the EU's Community Acquis. Third, productivity literature suggests a positive and causal relationship between competition policy, market structures and firm-level productivity.

Determinants of market structure

Entry barriers

The main determinant of market structures are entry barriers. Especially sunk costs affect firm entry, and thereby markets structures (Nickell, 1996; Sutton, 2006; Economides, 1996). Sunk costs can be exogenous, i.e. driven by physical investment or endogenous, i.e. driven by technology. The higher the capital intensity and the larger firms are, the higher barriers to firm entry become and the lower the firm turnover in a given industry is. Higher sunk costs imply a higher market concentration (Dunne et al., 2009). Especially in transition processes firm entry plays a key role in the economic dynamism. New and more productive firms arrived after initial macro-economic adjustments, thereby establishing new industries and contesting existing markets. In the 1990s, total firm turnover ranged between 3-8% in most industrial countries and exceeded 10% in most transition economies. The net entry of firms, the entry minus the exit rate, was particularly large amongst micro firms with fewer than twenty employees, an almost non-existing size class before the transition (Kornai, 1992, Bartelsman et al., 2004).

Ownership

When a firm is (partly) state-owned it is likely to be shielded from competition, leading to fewer incentives to maintain efficiency levels typical to its market (Djankov and Murrell, 2002). The reverse pattern is assumed for firms held by foreign owners. Foreign owned firms are more technology intensive (Correa et al., 2010), and their presence pressures domestic firms to be more efficient (Ferrier et al., 1998). This also affects the firm's competitive situation. Albeit the bulk of old and less productive state-owned enterprises exited or were privatised, state-ownership is still related to lower productivity than private firms. This might be due to indirect effects (Friesenbichler et al., 2014).

Technology and spill-overs

Market structures are also a function of a firm's quality choice and capabilities, which is for instance mirrored by its quality of human capital or technology use. Firms that are technologically more advanced are more likely to differentiate themselves and cover market niches and are more innovative. Such firms tend to face less competition and operate in more concentrated markets (Syverson, 2011). However, empirical and theoretical evidence on the directionality and relationship between competition and innovation can vary according to the different nature and initial intensity of competition or characteristics of the

firms in the sample used (Arrow, 1962; Aghion et.al., 2005; de Bondt and Vandekerckhove 2012; Peneder and Woerter, 2013). Technologically apt firms often compete on international markets (Syverson, 2011). The effects of trade openness on the domestic degree of competition, however, are indirect. Openness to trade and FDI was a key policy measure that fostered the transition. Markets that exhibit high levels of openness also experience higher foreign competitive pressure at the firm level (Clarke, 2011; Dunne, 2013), leading to spill-overs to the local economy and thereby altering the domestic firm base.

Industry specific factors

At the industry level, market structures are affected by sector specific regulations, the available technology base and entrepreneurial opportunities (Martin, 2012). A special case is the presence of network effects that biases the structure towards more concentrated markets due to the type of competition, which favours competition for the market instead of competition within the market (Economides, 1996).

Country specific factors

A country's history and path dependence, resource wealth, or policy makers' willingness to undertake economic and regulatory reforms also affects market structures (Münich and Svejnar, 2007; Bartelsman et al., 2004).

Competition policy and the Community Acquis

Market structures can be explained by micro-economic factors and are therefore endogenous. This implies that a firm in a given market can, at least partly, influence its competitive positioning. For instance, it can change its technology base in an attempt to escape competition. However, it may also seek to preclude competition by anti-competitive behaviour, which comes at the expense of consumers and the economy as a whole. Competition policies, in particular anti-trust policies (control of anticompetitive agreements, mergers and abusive practices) are set to maintain market efficiency and try to preclude such behaviour (Lyons, 2009). Policy makers therefore affect both competition and market structures beyond industrial characteristics and dynamics.

The implementation of pro-competitive policies and anti-trust laws was fuelled by the prospect of EU-membership, and has effectively increased competition in the economies of Eastern Europe and Central Asia (Boeheim and Friesenbichler, 2014; Estrin, 2002; Dutz and Vagliasindi, 2000; Vagliasindi, 2001). Interestingly, the results for the transition countries in

Central and Eastern Europe are much stronger than for other developing countries. For instance, Kee and Hoekman (2007) find in a cross-country study on 42 developed and developing economies no direct effect of competition law on mark-ups as a proxy for competition. However, the authors also refer to an indirect effect of competition policy on domestic firm entry, thereby affecting the long run level of mark-ups.

Such evidence points at the relevance of economic policies. Perhaps the most direct factor in a pro-competitive policy mix is competition policy, which can be defined as competition legislation (merger control, market power abuse and cartels) and its enforcement (Buccirossi et.al., 2011). This definition is mirrored by the subchapter competition policy of the Community Acquis, which is '*the common foundation of rights and obligations which binds together the Member States of the European Union*' (cf. EuroVoc).¹ The competition acquis covers anti-trust as well as state-aid control policies, including rules and procedures to fight anti-competitive behaviour by companies, to scrutinise mergers and acquisitions, and to prevent governments from granting state-aid which distorts competition in the internal market. The competition rules are directly applicable in the whole European Union. Member States are obliged to co-operate fully with the European Commission in enforcing them.²

Competition policy is not a stand-alone matter, but interacts with other subchapters of the Community Acquis, such as freedom of labour and capital. These also include other forms of competition-enhancing policies, such as the reduction of administrative burdens, the removal of entry barriers for new firms on the market, consumer protection or ex-ante sectoral regulations.

As part of the accession process, the European Union imposes the acquis on the candidate countries (Boeheim and Friesenbichler, 2014). Competition policies and other conditions of membership leave some interpretive flexibility and are not necessarily implemented to the same degree in all countries that join the EU (Grabbe, 2002), which can also be interpreted as a means to flexibly consider country-specific characteristics. Institution-building and legislation were developed fast, and maintained a decent enforcement of anti-trust practice (Hölscher and Stephan, 2004). CEE countries do not seem to struggle with competition policy reforms demanded by the Community Acquis, even though their levels of competition tend to be lower (Hölscher and Stephan, 2009).

¹ See <http://eurovoc.europa.eu/drupal/?q=request&uri=http://eurovoc.europa.eu/210682>.

² See http://ec.europa.eu/enlargement/policy/conditions-membership/chapters-of-the-acquis/index_en.htm.

Productivity and competition

Competition policies are not an end in themselves, but are thought to promote overall economic performance. Neoclassical economics ascribes two effects to competition. First, prices converge to marginal production costs, from which consumers benefit. Second, competition induces a dynamic process in which firms change their technology base (Arrow, 1962). In particular dynamic competition is a driver of industrial dynamism, where in the evolution of a firm base displaces inefficient firms and increases allocative efficiency. The vehicle for this creative destruction process are new technologies (Schumpeter, 1942), which is associated with more efficient firms and the emergence of new markets. Market competition can therefore be interpreted as a "search and discovery process" (Hayek, 1968), in which more competition is associated with greater firm-level productivity. Then again, endogenous growth theory (Romer, 1986; Aghion and Howitt, 1992) describes a rent dissipation effect, where an increase in product market competition between intermediate producers will reduce the profits expected from innovations, and hence the rate of technical change and the productivity that is linked to it.

Empirical studies typically find a positive effect of competition due to greater efficiency in plant operations and more efficient market allocation (Syverson, 2011; Martin, 2012). For the countries analysed in this study, Ospina and Schiffbauer (2010) find a positive and robust causal relationship between proxies for competition and measures of firm productivity. Countries that implemented product-market reforms had more pronounced increases in competition. The contribution to productivity growth due to competition spurred by product-market reforms approximates to 12 to 15 percent.

Hypotheses

From these considerations, one can extract three hypotheses of particular interest to our research question, and which can be tested with the present data:

Hypothesis I: *The degree of domestic competition increases with a country's EU-membership status.*

Hypothesis II: *Both competition policy and the regulatory framework provided by the EU at the country level are conducive to the degree of domestic competition.*

Hypothesis III: *Higher levels of domestic competition exert a positive effect on firm level productivity.*

2. Data and variables

The World Bank's Enterprise Surveys are the main data source of this study. These provide internationally comparable, establishment-level quantitative information obtained from face-to-face interviews. The implemented questionnaires cover a broad range of business environment topics, including the degree of competition and variables that allow computing productivity measures. They thereby provide a valuable source of information for firm-level productivity analysis.

The data are a representative sample of an economy's private sector. The survey followed a stratified random sampling strategy. The stratification considered i) firm size classes (micro: 1-5, small: 6-19, medium: 20-99, large: >99; large firms were oversampled), ii) regions at the district level, and iii) 22 industries (ISIC Rev. 3.1, 2-digit). Available sample weights were not used.

To study the effects of the introduction of pro-competitive policies with respect to EU-accession, the analysis requires countries in Eastern Europe and Central Asia. The specific dataset used is the Business Environment and Enterprise Performance Survey (BEEPS), which was jointly financed by the World Bank and the European Bank for Reconstruction and Development. The original dataset was provided by the World Bank, and covered the period 2002-2009. These data were appended by country-level survey data for 2012 and 2013.³ The final dataset provides information about 39,646 establishments in 27 countries, covering survey waves in 2002, 2005, 2007, 2009, 2012 and 2013 (see Table 1).⁴

Table 1 about here

³ The datasets, sampling procedures and the methodology used in the data collection are publicly available. See <http://www.enterprisesurveys.org/>.

⁴ All datasets that were available on 13 October 2014 were used to consider the survey wave in 2013.

The following describes the variables that were used to study the impact of EU-membership status and competition policies on market structures. A set of control variables was computed to capture other determinants of market structures that the literature review suggests. These include the skill level of human capital, entry barriers (capital intensity), ownership structures, market size (size of locality at the firm and population density at the country level) and industry and country specific effects. Eventually, data on inputs, labour and capital were used to estimate total factor productivity levels.

Dependent variable

The number of competitors. To capture the degree of competition, an ordinal market concentration variable that measures the number of competitors was constructed. The variable can take three values. It assigns '1' to a monopoly, '2' to a highly concentrated market (either a duopoly or an oligopoly with no more than four or five competitors), and '3' to a polypoly, where the respective firm reports more than four or five competitors. The threshold for a polopoly changes over time due to changes in the answer categories in the questionnaires.⁵ However, it seems unlikely that this issue will bias the results given that the categories are an approximation of the market concentration. It is assumed less concentrated market structures represent more competitive firm behaviour.⁶

Key independent variables

EU-membership status. This country-year level variable was constructed using official information provided by the European Commission about the membership and negotiation status. The sampled countries were assigned to four ordinal categories over time: no affiliation to the EU (1), countries that will potentially hold negotiations (2), candidate countries (3) and member states (4).⁷

⁵ The survey instruments in 2002 and 2005 asked about the number of competitors in the local market for the main product line or service (q12ba). The given answer categories were "none", "1-3" and "4 or more". The question in the survey waves 2007 and 2009 was 'How many competitors did this establishment's main product/product line face?' (e2). Possible answers were "none", "one", "2-5" and "more than 5". The survey waves 2012 and 2013 contain a question about the number of competitors for the main product/service in the main market (e2b). The answer category 'more than I can count' was assigned to the polypoly.

⁶ A distinction needs to be made between market structures and competition. Market structures mainly refer to the number of firms and perhaps their size distribution, while this may differ from competitive firm behaviour at the industry level (Martin, 2012).

⁷ See http://ec.europa.eu/enlargement/index_en.htm.

Regulatory quality. The index captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. It is provided by the Worldwide Governance Indicators database.

Control variables

Labour. The labour stock is defined as the absolute number of persons employed full time.

University. The fraction of the persons employed full time that holds a university degree.

Capital-labour-ratio. The capital labour ratio is computed as the capital stock divided by labour stock. The capital stock is defined as the replacement value of machinery, vehicles, equipment, land and buildings.

Export share. This is the percentage of total sales that were exported, either directly or indirectly (sold domestically to a third party that exports products).

Firm age. The firm age is the difference between the survey year and the year in which the establishment began operations.

Foreign ownership. This is a dummy variable that takes on the value one if at least one of the (co-)owners is a private foreign individual, company or organisation.

State ownership, majority. A dummy variable that takes on the value one, if at least one of the (co-)owners is the government or the state, and if the public stake exceeds 50%.

State ownership, minority. A dummy variable that takes on the value one, if at least one of the (co-)owners is the government or the state, but holds a stake less than 50%.

Size of locality. An ordinal variable indicates if the establishment is located in the country's capital or a locality of more than one million inhabitants (4), in a locality between 250,000 and one million (3), between 50,000 and 250,000 (2), or a locality with fewer than 50,000 inhabitants (1).

Industry affiliation. Firms are assigned to 15 manufacturing and 9 service industries at the ISIC Rev. 3.1 two-digit level.

Country and time effects. Dummy variables control for the survey waves and country-wide effects.

Country-level control variables. Additional country level variables are the population density, the area of the country and GDP per capita (base year 2005). The data were drawn from the World-Bank Development Indicator Database.⁸

Variables used in the productivity analysis

Sales. The establishment's total annual sales.

Labour. The labour stock is defined as the absolute number of persons employed full time.

Capital stock. The capital stock is defined as the replacement value of machinery, vehicles, equipment, land and buildings.

Intermediate inputs. The cost of raw materials and intermediate goods used in production in the last fiscal.

Descriptive statistics

Data from survey waves conducted in several years were used. To make monetary values comparable over time, these were deflated with 2005 as the reference year. The deflators were obtained from the IMF. The values in the original dataset that were provided in USD were first converted back into the local currency, deflated, and then converted back into US dollars with the exchange rate for 2005. The exchange rates used were obtained from the Word Bank Indicators (official exchange rate; local currency unit per US\$, period average), which does not include Euro countries, however. Eurostat data were used for the official Euro conversion rate as well as the exchange rate from Euro to USD. Table 2 provides an overview of the descriptive statistics for the pooled sample.

Table 2 about here

⁸ See <http://data.worldbank.org/data-catalog/world-development-indicators>

3. Estimation technique and results

The available data is a repeated cross section, i.e. a random sample that is taken from the population at consecutive points in time. Since the surveyed firms differ over time, firm specific histories cannot be included, rendering panel econometric techniques unfeasible and thereby complicating the establishment of causal relationships. Also, the data cannot be collapsed and converted into a panel, since the averaging of variables would capture noise due to the random stratified sampling on which the data generation process relied. Such data would be exposed to within small-sample bias, which can only be avoided in very large sample sizes (Verbeek, 2008; Devereux, 2007) that the current data does not provide.

Yet, several arguments in favour of making causal arguments despite the cross sectional nature of the data can be made (e.g., Greene, 2003; Antonakis et al., 2010). These refer to the sampling strategy, a sample manipulation in and the use of instrumental variables in the productivity presented in the next section.

First, the stratified random sampling process generates a representative sample, implying that changes in the macroeconomic environment should, on average, also be mirrored at the firm level even if different firms are surveyed. However, macro-economic regressions do not provide evidence of the impact of economic policies on firm-specific market structures, and how these reflect on firm-level productivity.⁹

Second, the results are robust to a sample manipulation. While some countries changed their membership status over time, others held their status constant. The entire sample covers a wide range of countries, including developing economies of Central Asia for which EU-membership is currently out of question. This information is used in a sample split. First, all non-accession countries serve as a control group. Second, only observations in countries that changed their membership status are considered in the estimates, i.e. only firms in countries that received the 'treatment' were considered. These comprise Poland, Romania, Serbia, Bosnia and Herzegovina, FYROM, Estonia, Czech Republic, Hungary, Latvia, Lithuania, Slovakia, Slovenia, Bulgaria and Croatia.

Third, we consider possible endogeneity issues that affect the third hypothesis. There might be reverse causality between productivity and market structures, which is why we use an instrumental variable approach, thereby improving the validity of causal claims.

⁹ Collapsing the micro-data at the country-year level allows for a fixed effect at the macro-economic level. These unreported results confirm the conjecture that EU-membership is associated with less concentrated markets.

To estimate the effect of EU-accession on the market structure in which a firm operates all data was pooled to implement an ordered logit estimator. The main equation explains the reported market structure as a proxy for competition (COMP) of firm i , in sector j and country k by the membership status (STATUS). μ denotes specific fixed effects measured as dummy variables. The specifications consider a set of control variables at the firm (Z) and country (K) level. α stands for the intercept, and β for the respective coefficients; the error term is labelled u . The standard errors are assumed to be serially correlated, and were clustered at the country and survey-year level. This leads to the following main equation:

$$\text{COMP}_{i,j,t,k} = \alpha + \beta_1 \text{STATUS}_{t,k} + \beta_2 \mu_k + \beta_3 \mu_j + \beta_4 \mu_t + \gamma' Z_{i,j,t,k} + \gamma'' K_{t,k} + u_{i,j,t,k} \quad (1)$$

Three regression specifications were used to analyse if pro-competitive policies related to EU-membership affect the market structures in which firms operate. The first specification considers each stage of the EU-membership status separately. The second regression treats the membership-status as a single, discrete variable. The third regression adds a competition policy indicator and its interaction with EU-membership to analyse the specific effect of competition policies.

We control for time-invariant country and industry specific effects. In addition, dummies controlled for the survey years. We also considered micro-economic indicators explaining market structures at the firm level, including the capital-, technology- and export intensity and ownership structures.

These specifications were used on two samples. First, we used the entire sample that also contains countries in Central Asia for which EU-membership is out of question. Second, we only used the countries of Central and Eastern Europe that changed their membership status over time.

Results for market structures and EU-membership

The first hypothesis that is tested asks if the degree of domestic competition increases with a country's EU-membership status. We find a positive impact of the EU-membership status on the degree of competition (see Table 3). The effect is stronger in the subsample that consists of the countries that changed their membership status over time, pointing at a causal impact of EU-membership.

In specification (1) and (4) the stages of the EU membership status are measured by dummy variables with the reference group of firms that are located in countries that does not hold accession talks with the EU. The impact of membership on the market structure increases the closer countries are to full membership. While for the full sample only member countries show a significant coefficient (1), the coefficient for candidate countries is also significant for the countries in the subsample (4). The coefficient on the index that measure of the membership status is positive and significant in regressions (2) and (5), reflecting a competition enhancing effect across the stages of EU membership (see Table 3).

Table 3 about here

The coefficients of specification (2) were used to predict the probabilities for a monopoly, an oligopoly or a polypoly across membership status. All other explanatory variables were held constant at their means. The marginal probabilities show that the likelihood of being a monopoly decreases from 3% for countries that are unaffiliated to the EU to 1.4% for EU member states. The likelihood for being in a polypoly increase from 69.7% in countries unaffiliated to the EU to 84% for EU member states (see Table 4).

Table 4 about here

Results for market structures and competition policies

Hypothesis II states that the degree of competition increases with the EU-membership status due to competition and anti-trust law. The following specification includes the regulatory quality index as a proxy for competition policies. Both the mean and minimum value of the regulatory quality increases with the EU-membership status. Member states have a higher lower bound level of the index, which at 2.9 lies above the mean values of accession countries and countries that are unaffiliated to the EU. Accordingly, the dispersion becomes smaller with EU-membership (see Table 5).

Table 5 about here

Next, we test Hypothesis II stating that both competition policy and the regulatory framework provided by the EU at the country level are conducive to the degree of domestic competition. This is shown by interacting the status variable and the competition policy index 'regulatory quality'. While the interaction term is positive and highly significant, the coefficients for status and regulatory quality turn insignificant. This suggests that competition policy has a positive effect on the degree of competition, but only if it is jointly delivered with other pro-competitive policies that are embedded in the Community Acquis.

The control variables perform as expected. The coefficients for barriers to market entry such as firm size and age are negative, as are the proxies for the quality of the firm, such as foreign ownership and the skill intensity of the human capital. The effects for state ownership on the market structure depend on the size of the state's stake. The coefficients for minority ownership are insignificant and oscillate around odds ratios of one. However, majority state-owned enterprises face substantially fewer competitors than privately owned firms. The coefficients for the export share point at a negative relationship between, indicating that nationally competing firms operate in a different market and export less. The coefficients for the capital labour ratio as indicator for entry barriers and for the size of the locality measuring the market size are mostly insignificant.

Results for TFP

This section tests hypothesis III, which states that competition policies and other pro-competitive policies embedded in the Community Acquis has positive effects on total factor productivity (TFP) at the firm level. To conduct this analysis, a TFP-index is first estimated, which is subsequently linked to EU-membership status and competition policies.

To generate the TFP indicator we follow Syverson (2011) and World Bank methodology (e.g., Saliola and Seker, 2011). We first compute value added as the difference between sales and intermediate inputs. Second, this indicator is regressed on the firm-specific labour and capital stock, and the interaction of industry specific effects with capital and labour. The regression also includes time dummies and is conducted for each country. Standard errors were clustered at the country-year level to control for the survey design.

$$VA_{i,j,t} = \alpha + \beta_1 Li_{i,j,t} + \beta_2 Ki_{i,j,t} + \beta_3 Li_{i,j,t} * \mu_j + \beta_4 Ki_{i,j,t} * \mu_j + \beta_5 \mu_t + U_{i,j,t} \quad (2)$$

TFP is calculated at the firm level as the sum of intercept and the residual of equation (2) as a percentage of the firm's value added. The productivity indicator (3) reflects a firms' size-independent productivity, or the contribution of productivity to the value added, respectively.

$$TFP = (\alpha + U_{i,j,t}) / VA_{i,j,t} \quad (3)$$

The TFP levels are similar to productivity levels that were previously reported for the region (e.g., Saliola and Seker, 2011). The descriptive statistics do not show a trend in the mean and median TFP levels by membership status. However, the productivity distribution across membership states shows a decrease in its variance in the countries that are either EU-members or candidates (see Table 6 and Figure 1). This pattern is in line with firm performance literature. While countries are characterised by large and persistent heterogeneity in firm-level productivity (e.g., Bartelsman et al., 2004), cross-country differences in economic performance have been related to within-differences in the productivity dispersion across firms (e.g. Hsieh and Klenow, 2009; Bartelsman et al., 2013). Empirical studies show that the regulatory environment is an aspect that robustly affects aggregate productivity (Méon and

Weill, 2005). Hence, the efficiency of the policy environment, presently expressed by the EU-membership status, seems to affect the firm-level productivity distribution.

Table 6 about here

Figure 1 about here

To test Hypothesis III, we use two key variables - market concentration and the EU-membership status. Either ordinal variable is tested as separate dummy variables for each stage and as a trend. The same variables as in the previous regressions were included to control for firm and country specific effects.

Three estimation techniques were used to estimate the effect of market structures and EU-membership on TFP. First, a median regression seeks to control for outliers in the productivity indicator. A robust quantile regression was used (Angrist et al., 2006; Chamberlain, 1994; Verardi and Croux, 2009); the Glejser test confirmed heteroskedasticity in the standard errors (Machado and Santos-Silva, 2000). Second, an ordinary least squares regression with serially correlated standard errors at the country-year level is presented as a robustness check. Third, an instrumental variable approach with robust standard errors seeks to control for the possible presence of endogeneity issues due to reverse causality.

Table 7 about here

The first regression (1) only considers the effect of competition and membership status on productivity over and above time, industry and country dummies. The second regression

includes the firm characteristics (2). Both variables were considered as dummy variables to show the effects of each stage against the baseline of being a monopolist or being a country that is not affiliated with EU-membership, respectively. For instance, full EU-membership offers a common market, access to European funds, or harmonised regulations in some industries, which are made available stepwise in the accession process. The results are statistically insignificant for EU-membership, but show decreasing coefficients with increasing competition. The results from the OLS regressions find similar results for competition, but a positive effect of EU-membership on firm productivity. The results from specifications (3) and (6), where the key variables are included as ordinal variables instead of dummies, confirm the picture from the previous regressions.

The control variables show the expected signs. A larger share of university graduates, foreign ownership as well as the size of the firm's locality, a proxy for market size, are positively related to productivity. On the other hand, older firms are less productivity, and there is some evidence from the median regressions that state ownership is negatively associated with firm productivity. All specifications control for country, time and industry effects, which explains why the country-level control variables are insignificant.

These OLS regressions might suffer from an endogeneity problem due to reverse causality between productivity and competition. Next, the market structure was instrumented by a set of policy variables that are derived from the previous analysis – dummies for the EU-membership status, the regulatory quality indicator the interaction of the regulatory quality indicator with the EU-membership status. A 2SLS estimator with robust standard errors confirms the coefficients from the previous estimates. Clustering standard errors led to a model in which the covariance matrix of moment conditions was not of full rank; these unreported results, however, showed similar signs and significance levels for the key variables.

Table 8 about here

The post-estimation tests find that the IV regressions are statistically valid (see Table 8). The Hansen J statistics indicate that the residuals are uncorrelated with the set of exogenous

variables. The Paap-Kleiberg statistics reject under-identification. However, the Stock-Yogo test finds that regression (7) is weakly identified. Regression (8) considers possible multicollinearity between the membership-status variable and regulatory quality with country level controls such as GDP per capita. Dropping the country-level controls changes the Stock-Yogo statistic to a strong instrumentation without altering the basic findings.

4. Summary and conclusions

This study examined the impact of policy-reforms that occur as part of the accession process to the European Union. We are particularly interested in the emergence of a level-playing-field for entrepreneurs, which does not seem to be the case in many countries that are 'stuck in transition' (EBRD, 2013). We asked if policies related to EU-membership affected firm-level productivity via policy-induced less concentrated market structures. The results suggest that the pro-competitive policies that are involved with EU-accession lead to less concentrated markets and eventually increase firm productivity. This evidence is highly relevant to policy makers in countries that are uncertain as to whether or not pursue EU-accession.

EU membership brings about a set of pro-competitive policies like the common market. This is embedded in the Community Acquis, the common legal basis of the Member States of the European Union. In addition, EU-membership requires the effective implementation of competition law. Descriptive statistics indicate that competition policy, quantified by the regulatory quality index from the World Governance Indicators, improves with EU-membership status, i.e. from countries that are unaffiliated with the EU, to potential candidates, candidates and eventually member states.

Our results at the firm level suggest that pro-competitive policies were likely to have led to less concentrated markets, and were particularly effective if combined with competition policies. Being in a polypoly becomes more likely in EU member states than in countries that are unaffiliated with EU-membership. Accordingly, the likelihood of being a monopoly decreases with EU-membership.

Next, we linked both EU-membership and market concentration to a firm-level TFP indicator. While the membership status did not affect the mean and median of the TFP level across membership status, the variance of firm-level productivity was decreasing as countries change their status. This indicates that the efficiency of the policy environment, presently expressed by the EU-membership status, seems to affect the firm-level productivity

distribution. The more efficient an environment is the lower the dispersion of productivity becomes.

Market concentration was then positively associated with total factor productivity at the firm level. This relationship was found to be robust in instrumental variable regressions controlling for endogeneity issues between market structure and productivity. In addition, the results pointed toward a weak, but positive relationship between TFP levels and EU-membership.

Acknowledgements and disclaimer

For valuable comments and suggestions I would like to thank Karl Aiginger, George Clarke, Geoffrey Hewings, Peter Huber, Bruce Lyons, Michael Pfaffermayr, Michael Peneder and the participants of workshop on "Sustainable Regional Growth and Cohesion" in Vienna on 1-2 September 2014. I am very grateful to Anna Strauss and Elisabeth Neppl for their research assistance. Research support from the Anniversary Fund of the Oesterreichische Nationalbank (project number 15280) is gratefully acknowledged. The usual disclaimer applies.

References

- Aghion, P., and P. Howitt, 1992, "A Model of Growth Through Creative Destruction," *Econometrica*, vol. 2, pp. 323–351.
- Aghion, P., Bloom, N., Blundell, R., Griffith, R. and Howitt, P. (2005), "Competition and innovation: an inverted-U relationship", *Quarterly Journal of Economics* 120, 701-728
- Angrist, J.; Chernozhukov, V. and Fernández-Val, I. (2006). Quantile Regression under Misspecification, with an Application to the U.S. Wage Structure, *Econometrica*, 74, 539-563.
- Antonakis, J, Bendahan, S., Jacquart, P. Lalive, J. (2010), "On making causal claims: A review and recommendations, *The Leadership Quarterly*, 21, 1086–1120.
- Arrow, K. (1962), "Economic welfare and the allocation of resources for invention", in: Nelson, R., "The rate and direction of inventive activity", Princeton University Press
- Bartelsman, E. J., Haltiwanger and J., Scarpetta, S., (2004), Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries, SSRN Scholarly Paper, Social Science Research Network, Rochester, NY.
- Bartelsman, E., Haltiwanger and J., Scarpetta, S., (2013), 'Cross-Country Differences in Productivity: The Role of Allocation and Selection', *American Economic Review*, 103(1), pp. 305–334.
- Bevan, A.A., Estrin, S. (2000), The Determinants of Foreign Direct Investment in Transition Economies, William Davidson Institute Working Paper 342, Centre for New and Emerging Markets, London Business School.
- Buccirossi, P., Ciari, L., Duso, T., Spagnolo, G., Vitale, Ch., (2011), Measuring the Deterrence Properties of Competition Policy: The Competition Policy Indexes, *Journal of Competition Law and Economics*, 7(1), 165-204.

- Chamberlain, G. (1994), Quantile Regression, Censoring and the Structure of Wages, in *Advances in Econometrics*, ed. C.A. Sims, Cambridge University Press, 171-209.
- Clarke, G.R.G. (2011), "Competition Policy and Innovation in Accession countries: Empirical Evidence", *International Journal of Economics and Finance*, 3:3, doi:10.5539/ijef.v3n3p38
- Correa, P. G., Fernandes, A. M., Uregian, C. J. (2010), "Technology Adoption and the Investment Climate: Firm-Level Evidence for Eastern Europe and Central Asia", *World Bank Economic Review*, World Bank Group, vol. 24(1), pages 121-147.
- de Bondt, R., Vandekerckhove, J. (2012), Reflections on the Relation Between Competition and Innovation, *Journal of Industry, Competition and Trade*, 12, 7-19.
- Devereux, P. (2007), Small Sample Bias in Synthetic Cohort Models of Labor Supply, *Journal of Applied Econometrics*, 22, 839–848.
- Djankov, S, Murrell, P (2002) Enterprise Restructuring in Transition: A Quantitative Survey", *Journal of Economic Literature*, 15, 739–792.
- Dunne, T., Klimek, S. D., Roberts, M. J., Xu, D. Y. (2013). "Entry, Exit and the Determinants of Market Structure". *The RAND Journal of Economics*, 44 (3), 462–487
- Dutz, M. A., Vagliasindi, M. (2000), "Competition policy implementation in transition economies: An empirical assessment", *European Economic Review*, Volume 44, Issues 4–6, May 2000, 762-772.
- EBRD (2013) *Stuck in Transition? Transition Report 2013*", European Bank for Reconstruction and Development, London.
- Economides, N. (1996), The Economics of networks, *International Journal of Industrial Organization*, 14, 673-699.
- Estrin, S. (2002), "Competition and Corporate Governance in Transition", *The Journal of Economic Perspectives*, Vol. 16, No. 1 (Winter, 2002), 101-124 (paper 13)
- Ferrier, G.D., Klinedinst, M., Linvill, C. B. (1998), "Static and Dynamic Productivity among Yugoslav Enterprises: Components and Correlates", *Journal of comparative economics* 26, 805–821
- Boeheim, M., Friesenbichler, K. S., Does accession to the European Union foster competition policy? Country-level evidence, WIFO-Working Paper 491/2014, Vienna.
- Friesenbichler, Klaus, Böheim, Michael, Laster, Daphne-Channa (2014a), "Market competition in transition economies: A literature review", WIFO-Working Paper, 477/2014, Vienna, 2014
- Grabbe, H., European Union Conditionality and the "Acquis Communautaire", *International Political Science Review*, 2002, 23(3), 249-268.
- Greene, W.H. (2003). *Econometric Analysis*. 5th Ed. Englewood Cliffs, NJ: Prentice Hall.
- Havrylyshyn, O., (2013), "Is the transition over? A definition and some measurements", in: In: Hare, P., Turley, G. (eds.), "Handbook of the economics and political economy of transition", chapter 4, pp. 59-73, Routledge, Taylor & Francis Group.
- Hayek, F.A., (1968), *Der Wettbewerb als Entdeckungsverfahren*, Tübingen
- Høj, J. (2007), "Competition Law and Policy Indicators for the OECD countries", OECD Economics Department Working Papers, No. 568

- Hölscher, J., Stephan, J., Competition and Antitrust Policy in the Enlarged European Union: A Level Playing Field?, *Journal of Common Market Studies*, 2009, 47(4), 863-889.
- Hölscher, J., Stephan, J., Competition Policy in Central Eastern Europe in the Light of EU Accession, *Journal of Common Market Studies*, 2004, 42(7), 321-345.
- Hsieh, C.-T. and Klenow, P. J., (2009), 'Misallocation and Manufacturing TFP in China and India', *The Quarterly Journal of Economics*, 124(4), pp. 1403-1448.
- Kee, H. L., Hoekman, B. (2007), Imports, entry, and competition law as market disciplines, *European Economic Review*, 51(4), 831-858.
- Kornai, J. (1992), The Postsocialist Transition and the State: Reflections in the Light of Hungarian Fiscal Problems, *The American Economic Review*, 82(2), 1-21.
- Lyons, B. (Ed) (2009), "Cases in European Competition Policy: the Economic Analysis", Cambridge University Press
- Machado, J.A.F. and Santos Silva, J.M.C. (2000), Glejser's Test Revisited, *Journal of Econometrics*, 97(1), 189-202.
- Martin, S., (2012), "Market Structure and Market Performance", *Review of Industrial Organization*, 40, 87-108.
- Méon, P.-G. and Weill, L., (2005), 'Does better governance foster efficiency? An aggregate frontier analysis', *Economics of Governance*, 6(1), pp. 75-90.
- Münich, D., Svejnar, J. (2007), Unemployment in East and West Europe, *Labour Economics*, 14(4), 681-694.
- Nicholson, M.W. (2008), "An antitrust law index fro empirical analysis of international competition policy", *Journal of Competition Law & Economics*, 4 (4), 1009-1029.
- Nickell, S. J. (1996). Competition and corporate performance. *Journal of Political Economy*, 104 (4), 724-746,
- Ospina, S., Schiffbauer, M. (2010), "Competition and Firm Productivity: Evidence from Firm-Level Data", IMF working paper No. /10/67
- Peneder, M., Wörter, M. (2013), Competition, R&D and Innovation: Testing the Inverted-U in a Simultaneous System, *Journal of Evolutionary Economics*, 24(3), 653-687.
- Romer, P., 1986, "Increasing Returns and Long-run Growth," *Journal of Political Economy*, vol. 94, no. 5, pp. 1002-1037.
- Saliola, F., Seker, M. (2011), „Total Factor Productivity Across the Developing World“, Enterprise Surveys - Enterprise Note Series No. 23., The World Bank, IFC, Washington DC.
- Schumpeter, J. 1942. *Capitalism, Socialism, and Democracy*. New York: Harper & Bros.
- Sutton, J., 1991, *Sunk Costs and Market Structure* (M.I.T. Press, Cambridge, MA).
- Syverson, C. (2011). What determines productivity? *Journal of Economic Literature*, 49, 326-365.
- Vagliasindi, M. (2001), "Competition across transition economies: an enterprise-level analysis of the main policy and structural determinants", EBRD working paper No. 68, paper 18.
- Verardi, V, Croux, C. (2009), Robust regression in Stata, *The Stata Journal*, 9(3), 439-453.
- Verbeek, M. (2008), "The Econometrics of Panel Data", *Advanced Studies in Theoretical and Applied Econometrics*, 46, 369-383.
- Voigt, S. (2009), "The Effects of Competition Policy on Development – Cross-Country Evidence Using Four New Indicators", *The Journal of Development Studies*, 45:8, pp. 1225-1248.

Tables and Figures

Table 1: Sample coverage by country and survey wave

Country	Observations	Years	Status
Albania	1,093	2002, 2005, 2007, 2009, 2012	NC
Belarus	1,210	2002, 2005, 2009, 2013	NC
Georgia	1,109	2002, 2005, 2009, 2013	NC
Tajikistan	1,097	2002, 2005, 2009, 2013	NC
Ukraine	2,912	2002, 2005, 2009, 2013	NC
Uzbekistan	929	2002, 2005, 2009	NC
Russia	6,333	2002, 2005, 2007, 2009, 2012	NC
Poland	2,474	2002, 2005, 2009, 2013	C, MS
Romania	1,938	2002, 2005, 2009, 2013	PC, C, MS
Serbia	1,262	2002, 2005, 2009, 2013	NC, PC, C
Kazakhstan	1,981	2002, 2005, 2009, 2013	NC
Moldova	1,249	2002, 2005, 2009, 2013	NC
Bosnia	1,105	2002, 2005, 2009, 2013	NC, PC
Azerbaijan	1,292	2002, 2005, 2009, 2013	NC
FYROM	1,098	2002, 2005, 2009, 2013	NC, PC, C
Armenia	1,258	2002, 2005, 2009, 2013	NC
Kyrgyz	882	2002, 2005, 2009, 2013	NC
Estonia	937	2002, 2005, 2009, 2013	C, MS
Czech Republic	864	2002, 2005, 2009, 2013	C, MS
Hungary	1,463	2002, 2005, 2009, 2013	C, MS
Latvia	990	2002, 2005, 2009, 2013	C, MS
Lithuania	953	2002, 2005, 2009, 2013	C, MS
Slovakia	935	2002, 2005, 2009, 2013	C, MS
Slovenia	959	2002, 2005, 2009, 2013	C, MS
Bulgaria	1,855	2002, 2005, 2007, 2009	PC, C, MS
Croatia	1,162	2002, 2005, 2007, 2009	PC, C, MS
Montenegro	306	2002, 2005, 2009, 2013	PC

Note: This table reports the country and year coverage. It provides information on the membership status of the country samples across time. NC denotes a country that is no candidate (i.e. does not hold accession talks); PC is a potential candidate (i.e. accession talks have been initiated); C is a candidate country and MS a member state.

Table 2: Descriptive statistics

	Obs.	Entire sample			Obs.	Split sample		
		Mean	Median	Std. Dev.		Mean	Median	Std. Dev.
Status	39,646	1.08	0.00	1.30	17,995	2.36	3.00	0.84
Competition	24,788	2.67	3.00	0.54	10,485	2.73	3.00	0.49
K/L (in 1000 USD)	13,461	216.93	5.44	4,556.01	7,567	116.50	8.91	3,849.60
Labour	39,382	97.15	20.00	410.97	17,856	100.24	18.00	377.17
Export, share	39,360	9.78	0.00	24.20	17,843	14.02	0.00	28.25
University, share	35,331	0.32	0.20	0.30	15,005	0.21	0.10	0.26
Foreign owner	39,373	0.12	0.00	0.32	17,860	0.13	0.00	0.34
State owner	39,372	0.08	0.00	0.27	17,862.00	0.07	0.00	0.26
Firm age	39,279	15.12	11.00	15.70	17,842.00	16.98	13.00	17.15
Size of locality	38,143	2.60	3.00	1.15	16,933.00	2.30	2.00	1.19
GDP p.c.	38,192	5,222.63	4,339.47	3,703.04	17,995.00	7,964.17	7,963.02	4,077.06
Pop. Density	39,646	68.59	78.52	40.15	17,995.00	87.75	85.08	28.63
Sales (in mn. USD)	30,542	191,000.00	0.47	23,500,000.00	14,493.00	399,000.00	0.84	34,100,000.00
Capital stock (in thsd. USD)	13,411	71,100.00	102.00	4,350,000.00	7,709.00	38,400.00	158.66	1,410,000.00
Intermediate inputs (in thsd. USD)	16,537	23,600.00	61.76	879,000.00	8,215.00	3,805.11	106.00	53,200.00

Note: This table provides descriptive statistics for the entire sample, as well as for the sample that changed the membership status over time. The data sources used were BEEPS data (World Bank Enterprise Surveys), WGI data (World Bank) and information on the accession process by the European Commission.

Table 3: Impact of EU-membership on the degree of competition

	(1)	(2)	(3)	(4)	(5)	(6)
Status		1.4418** (0.146)	0.7080 (0.253)		1.9847** (0.295)	0.9636 (0.374)
Pot. Cand.	1.1132 (0.159)			1.8929* (0.563)		
Cand.	1.3682 (0.261)			3.4080** (1.234)		
MS	2.3525** (0.669)			9.3914** (6.094)		
RQ			0.8635 (0.161)			0.6453 (0.242)
Status*RQ			1.2432* (0.135)			1.2902* (0.150)
K/L (ln)	0.9799 (0.015)	0.9792 (0.015)	0.9807 (0.015)	0.9543+ (0.025)	0.9550+ (0.025)	0.9572+ (0.025)
L (ln)	0.8932** (0.026)	0.8918** (0.026)	0.8923** (0.026)	0.8502** (0.033)	0.8475** (0.032)	0.8487** (0.032)
Uni (share)	0.6236** (0.096)	0.6223** (0.096)	0.6207** (0.095)	0.5463* (0.135)	0.5428* (0.133)	0.5419* (0.133)
Export (share)	0.9945** (0.001)	0.9944** (0.001)	0.9944** (0.001)	0.9952** (0.002)	0.9952** (0.002)	0.9952** (0.002)
State, min.	0.9195 (0.142)	0.9248 (0.142)	0.9236 (0.142)	1.1595 (0.283)	1.1752 (0.285)	1.1646 (0.282)
State, maj.	0.4496** (0.055)	0.4525** (0.055)	0.4544** (0.056)	0.4403** (0.083)	0.4487** (0.083)	0.4467** (0.084)
Foreign	0.6574** (0.055)	0.6568** (0.055)	0.6568** (0.056)	0.5522** (0.061)	0.5505** (0.061)	0.5537** (0.062)
Firm age (ln)	0.9047** (0.035)	0.9060* (0.035)	0.9044** (0.035)	0.9805 (0.058)	0.9813 (0.058)	0.9792 (0.058)
Size of locality	2.6223* (1.178)	2.5994* (1.151)	2.2254+ (1.028)	1.6040 (1.896)	1.7178 (2.061)	1.0876 (1.397)
GDP p.c. (ln)	31.8249** (27.743)	25.7317** (22.142)	28.2439** (24.690)	101.3767+ (241.854)	41.0850 (99.168)	43.4456 (102.914)
Pop. Dens. (ln)	1.0325 (0.028)	1.0307 (0.029)	1.0311 (0.029)	0.9824 (0.038)	0.9801 (0.038)	0.9802 (0.038)
Observations	8,320	8,320	8,320	4,403	4,403	4,403
Pseudo R ²	0.117	0.117	0.117	0.123	0.122	0.123

Note: The dependent variable for each regression is market structure. All regressions consider time, industry and country dummies. Regression (1), (2) and (3) is estimated on the entire sample, while (4), (5) and (6) only use firms in countries that changed their membership status. All regressions are estimated using ordered logit. The coefficients are reported as odds ratios. Heteroskedasticity robust standard errors are reported in parentheses. **, *, and + indicate significance at the 1%, 5% and 10% levels, respectively.

Table 4: Predicted marginal probabilities of market structures across membership status

Membership status	Unaffiliated	Potential candidate	Candidate	Member States
Polypoly	69.7%	75.2%	80.0%	84.0%
Oligopoly	27.3%	22.5%	18.3%	14.6%
Monopoly	3.0%	2.3%	1.8%	1.4%

Note: This table uses regression results of the market structure and membership status to report the marginal probabilities for each state. All other variables were held constant at their means. The reported values are highly significant (p-value: 0.000).

Table 5: Regulatory quality and EU-membership status

	Mean	Std. Dev.	Min.	Max.
No candidate	2.0	0.5	0.9	3.2
Pot. Candidate	2.4	0.3	1.9	3.1
Candidate	3.1	0.4	2.4	3.9
Member state	3.4	0.2	2.9	3.9
Total	2.5	0.7	0.9	3.9

Note: This table reports the descriptive statistics for regulatory quality and EU-membership.

Table 6: Descriptives - Total factor productivity and Sales per employee by membership status

	Obs.	Mean	Median	Variance
No affiliation	2841	0.08	0.08	0.07
Potential Candidate	564	0.08	0.08	0.05
Candidate	995	0.07	0.07	0.05
Member state	3204	0.08	0.07	0.05
Total	7604	0.08	0.08	0.06

Note: This table reports the descriptive statistics for the TFP indicator across EU-membership statuses.

Table 7: The impact of competition and the EU-membership status on productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Quantile regression				OLS regression		IV	
Comp			0.0049*			0.0042*	0.0852*	0.0390**
			(0.002)			(0.002)	(0.037)	(0.015)
Status			0.0045			0.0079**		
			(0.006)			(0.003)		
Oligopoly	0.0096+	0.0102*		0.0116+	0.0104			
	(0.006)	(0.005)		(0.006)	(0.007)			
Polypoly	0.0120*	0.0142**		0.0131*	0.0128+			
	(0.006)	(0.005)		(0.006)	(0.006)			
Poss. Cand.	-0.0159	0.0090		0.0131**	0.0634*			
	(0.012)	(0.058)		(0.004)	(0.029)			
Cand.	-0.0017	0.0192		0.0217**	0.0714*			
	(0.009)	(0.060)		(0.004)	(0.030)			
MS	-0.0095	0.0145		0.0271**	0.0796*			
	(0.007)	(0.065)		(0.007)	(0.032)			
Uni (share)		0.0253**	0.0255**		0.0283**	0.0285**	0.0338**	0.0307**
		(0.004)	(0.004)		(0.005)	(0.005)	(0.006)	(0.005)
Export (share)		0.0000	0.0000		0.0000	0.0000	0.0001+	0.0001
		(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
State, min.		-0.0118+	-0.0093		-0.0102*	-0.0102*	-0.0038	-0.0065
		(0.007)	(0.007)		(0.004)	(0.004)	(0.008)	(0.006)
State, maj.		-0.0069+	-0.0071+		-0.0023	-0.0026	0.0116	0.0039
		(0.004)	(0.004)		(0.005)	(0.005)	(0.009)	(0.005)
Foreign		0.0063*	0.0064*		0.0070*	0.0071*	0.0156**	0.0107**
		(0.003)	(0.003)		(0.003)	(0.003)	(0.006)	(0.003)
Firm age (ln)		-0.0056**	-0.0058**		-0.0063**	-0.0063**	-0.0039*	-0.0051**
		(0.001)	(0.001)		(0.001)	(0.001)	(0.002)	(0.001)
Size of locality		0.0033**	0.0033**		0.0035**	0.0035**	0.0017	0.0024**
		(0.001)	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
GDP p.c. (ln)		0.0024	-0.0061		-0.0049	-0.0055	-0.0065*	
		(0.026)	(0.023)		(0.013)	(0.012)	(0.003)	
Pop. Dens. (ln)		-0.0016	0.0231		0.0571+	0.0569+	0.0022	
		(0.064)	(0.059)		(0.033)	(0.032)	(0.002)	
Constant	0.0615**	0.0570	-0.0008	0.0659**	-0.1615	-0.1555	-0.0880	-0.0153
	(0.010)	(0.308)	(0.309)	(0.007)	(0.168)	(0.167)	(0.071)	(0.039)
Observations	4,945	4,633	4,633	4,945	4,633	4,633	4,633	4,633
R-squared	0.013	0.039	0.039	0.020	0.048	0.047	-0.4229	-0.0495

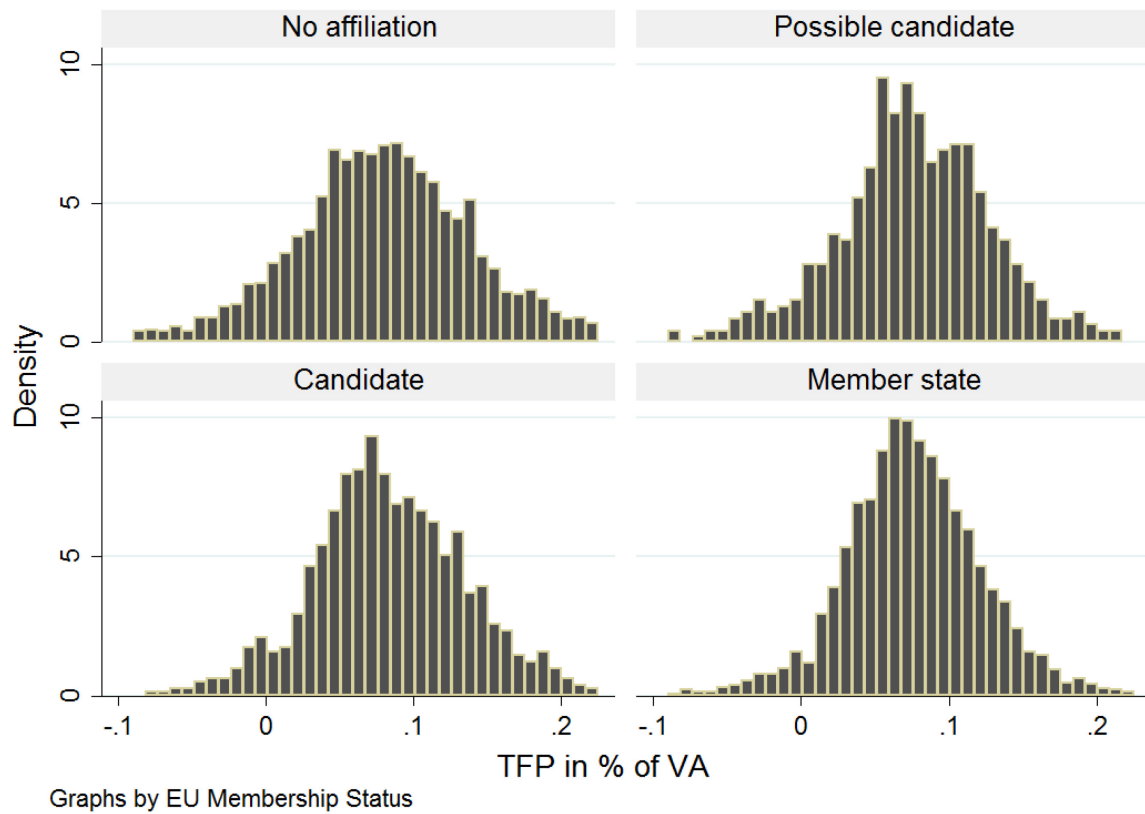
Note: The dependent variable for each regression is TFP. All regressions consider time, industry and country dummies. Each regression is estimated on the entire sample using OLS. Heteroskedasticity robust standard errors are reported in parentheses. **, *, and + indicate significance at the 1%, 5% and 10% levels, respectively. Centered R² measures are reported for the IV regressions.

Table 8: Reduced form results and post-estimation statistics

Reduced form coefficients of IVs			
Status*RQ	Coefficient	-0.01	-0.01
	p-value	0.007	0.004
Pot. Candidate	Coefficient	0.02	0.02
	p-value	0.004	0.002
Candidate	Coefficient	0.04	0.04
	p-value	0.004	0.002
MS	Coefficient	0.07	0.07
	p-value	0.007	0.004
RQ	Coefficient	0.01	0.01
	p-value	0.012	0.032
Post-estimation statistics			
Sargan test	p-value	0.462	0.147
Kleibergen-Paap rk LM statistic	p-value	0.007	0.000
Kleibergen-Paap rk Wald	F statistic	3.173	14.511
Stock-Yogo critical values	5% max. IV rel. bias	18.37	18.37
	10% max. IV rel. bias	10.83	10.83
	20% max. IV rel. bias	6.77	6.77
	30% max. IV rel. bias	5.25	5.25
Endogeneity test	p-value	0.013	0.021

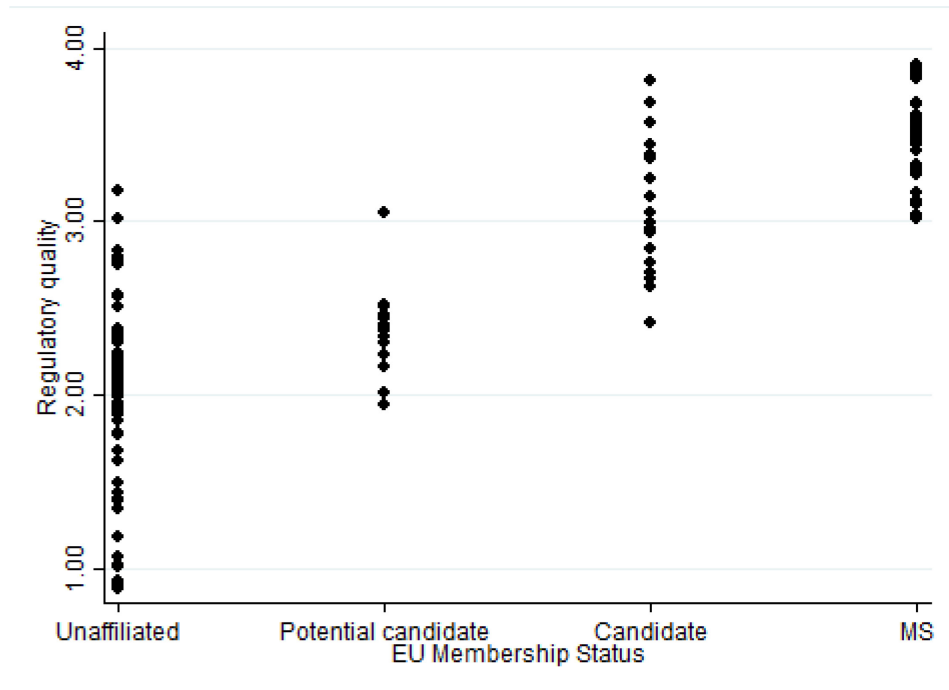
Note: This table reports the coefficients of the instruments of the reduced form equation of the instrumental variable regression, as well as the post-estimation statistics.

Figure 1: Total factor productivity at the firm level by membership status



Note: These figures show the distribution of TFP across the four membership statuses. 1st and 99th percentile excluded as outliers.

Figure 2: Regulatory quality and EU-membership status



Note: This table shows the values for the regulatory quality (i.e. the competition policy index) across EU-membership statuses.

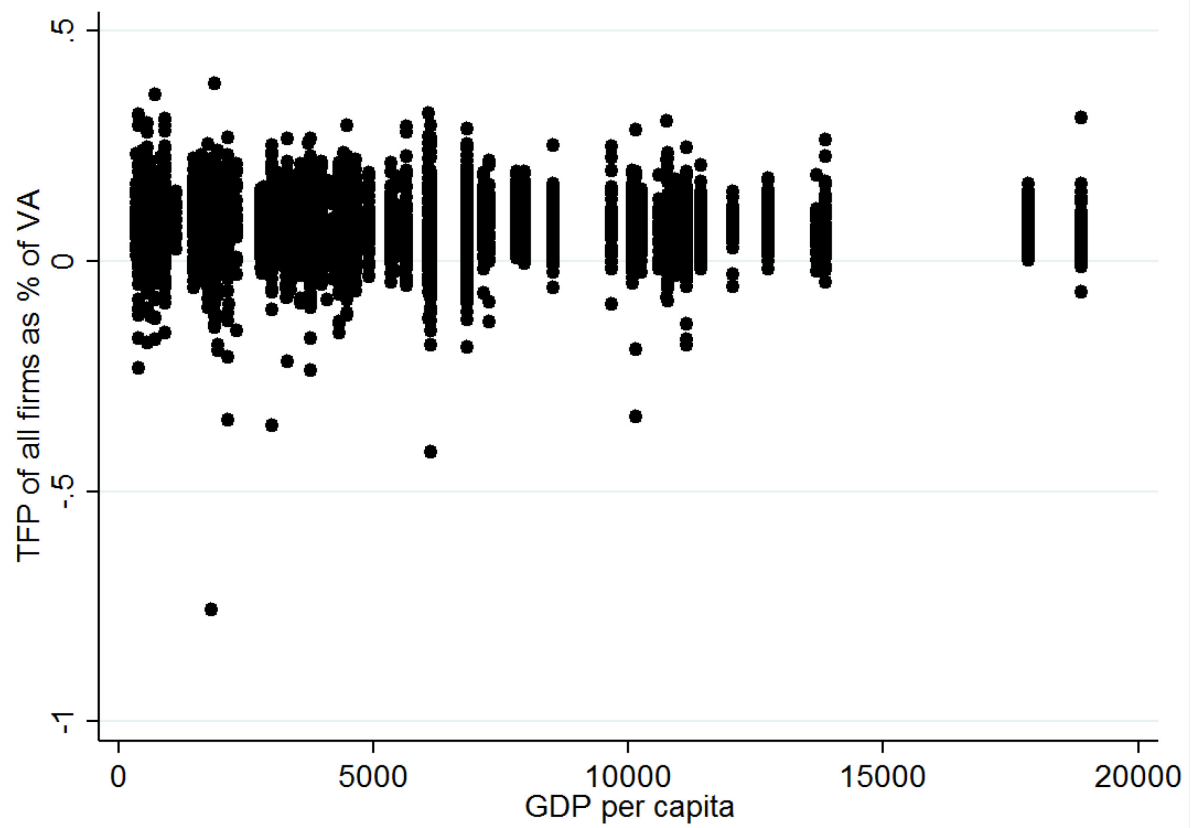
ANNEX - NOT FOR PUBLICATION

Table 9: OLS regressions on competition

	(1)	(2)	(3)	(4)	(5)	(6)
Status		1.0942** (0.027)	0.9283 (0.070)		1.1790** (0.068)	1.0502 (0.079)
Poss. Cand.	1.0516 (0.066)			1.1678+ (0.100)		
Cand.	1.1181 (0.084)			1.3569* (0.174)		
MS	1.2590* (0.112)			1.6885** (0.315)		
RQ			0.9249+ (0.040)			0.9056 (0.074)
Status*RQ			1.0532*			1.0437*
K/L (ln)	0.9934+ (0.004)	0.9933+ (0.004)	0.9934+ (0.004)	0.9908* (0.005)	0.9906* (0.005)	0.9910 (0.006)
L (ln)	0.9755** (0.005)	0.9751** (0.005)	0.9752** (0.006)	0.9706** (0.006)	0.9699** (0.006)	0.9703** (0.007)
Uni (share)	0.9148** (0.026)	0.9142** (0.026)	0.9138** (0.028)	0.9175** (0.028)	0.9163** (0.027)	0.9166* (0.030)
Export (share)	0.9989** (0.000)	0.9989** (0.000)	0.9989** (0.000)	0.9991** (0.000)	0.9991** 0	0.9991** (0.000)
State, min.	0.9767 (0.041)	0.9778 (0.041)	0.9772 (0.036)	0.9999 (0.060)	1.0025 (0.061)	1.0008 (0.051)
State, maj.	0.8391** (0.025)	0.8394** (0.025)	0.8401** (0.025)	0.8584** (0.031)	0.8599** (0.031)	0.8595** (0.032)
Foreign	0.9236** (0.016)	0.9234** (0.016)	0.9239** (0.016)	0.8999** (0.020)	0.8996** (0.020)	0.9003** (0.019)
Firm age (ln)	0.9809* (0.008)	0.9811* (0.008)	0.9805* (0.009)	1.0018 (0.012)	1.0018 (0.012)	1.0016 (0.011)
Size of locality	1.0059 (0.006)	1.0058 (0.006)	1.0058 (0.006)	0.9979 (0.007)	0.9976 (0.007)	0.9977 (0.006)
GDP p.c. (ln)	1.2219* (0.122)	1.2309* (0.123)	1.2439+ (0.153)	1.4284 (0.387)	1.4806 (0.392)	1.3863 (0.360)
Pop. Dens. (ln)	1.3837 (0.352)	1.3335 (0.339)	1.3627 (0.346)	3.8199+ (2.779)	2.9674 (2.168)	3.0802* (1.702)
Observations	8,193	8,193	8,193	4,276	4,276	4,276
R-squared	0.156	0.155	0.156	0.135	0.134	0.135

Note: The regressions consider country, year and industry dummies. Regression (1), (2) and (3) is estimated on the entire sample, while (4), (5) and (6) only use firms in countries that changed their membership status. All regressions are estimated OLS. Heteroskedasticity robust standard errors are reported in parentheses. **, *, and + indicate significance at the 1%, 5% and 10% levels, respectively. Centered R² measures are reported for the IV regressions.

Figure 3: TFP at the firm level and GDP per capita



Note: TFP was calculated as reported in the data.

Table 10: Fixed-effects macroeconomic regression of market structures, collapsed data.

	(1)	(2)	(3)
Pot. Cand.	1.0414 (0.041)	1.0970 (0.061)	
Candidate	1.1110+ (0.065)	1.1677* (0.081)	
Member State	1.2399* (0.128)	1.3753** (0.150)	
Status			1.1151** (0.040)
K/L (ln)		0.9871* (0.006)	0.9865* (0.006)
L (ln)		0.9347 (0.095)	0.9374 (0.093)
University		0.7225 (0.261)	0.7292 (0.251)
Export share		0.9991 (0.005)	0.9981 (0.005)
Stat. Maj.		0.7579 (0.392)	0.7295 (0.345)
Stat. Min.		1.7556 (1.558)	1.7795 (1.622)
Foreign owner		0.7831* (0.073)	0.7986* (0.071)
Firm age (ln)		0.9494 (0.088)	0.9680 (0.090)
Size of locality		1.0803+ (0.045)	1.0666 (0.045)
GDP p.c. (ln)	1.0195 (0.124)	1.0342 (0.111)	1.0303 (0.114)
Pop. Dens. (ln)	1.4545 (0.464)	2.2390* (0.826)	2.0789+ (0.747)
Constant	2.9240 (3.725)	0.6673 (1.243)	0.9091 (1.648)
Observations	106	102	102
R-squared	0.715	0.769	0.760

Note: All data were collapsed at the country level. All specifications consider time dummies. The first regression considers the membership status, GDP p.c. and population density as control variables. The second regression considers all control variables that were also used in the firm-level specifications reported in the data.