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# **Persistence of profits in the EU: How competitive are EU member countries?**

Johan E. Eklund<sup>1 2</sup> and Emma Lappi<sup>1</sup>

## **Abstract**

Profits that persist above or below the norm for prolonged periods of time revile a lack of competition and imply systematic misallocation of resources. Competition, if unimpeded, should restore profits to normal levels within a relatively short time frame. The dynamics of profits can thus reveal a great deal about the competitiveness of an economy. This paper estimates the persistence of profits across the European Union (EU), which adds to our understanding of the competitiveness of 19 EU-member states. By using a sample of approximately 5,500 firms with 54,000 observations across the time period of 1995 to 2013, we find differences in the persistence of short-run profits, implying that there are differences in competitiveness across the EU. Hungary and Greece are amongst the countries with the highest profit persistence, whereas the United Kingdom exhibits among the lowest persistence of profits. Furthermore, we provide evidence that there are significant permanent rents present in EU.

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## **I. Introduction**

Competition is a dynamic process driven by the entry and exit of firms, innovation and adaptation. This competitive process produces outcomes in which the prices and the variety of products are set in numerous of complex ways over time by a dynamic composition of firms. The most common way to measure the strength of market competition has been by making cross sectional analysis of profitability as profits provide a measurement of the deviation of prices from the marginal cost, which in turn provides information on the performance of the market and the firms. Therefore, a market is perceived as more competitive if profits above the norm do not persist for any extended period of time.

In the literature, there are two distinctly different views of profits: a static and a dynamic view. Under the static view, profits above the norm reflect some monopoly power, which is upheld by entry barriers. Under the dynamic view entrepreneurs, driven by the profit motive, introduce innovations and thereby create temporal monopolies. The latter is sometimes referred to as the Schumpeterian view of profits. However, we do not expect the profits of these temporal monopolies to persist (see Mueller 1976, 1986 and 2015 for discussion). Thus, there are two ways profits can behave in the long run. Either profit rates will converge to a zero-profit (competitive return) where all monopoly rents have been eliminated, or profits will persist.

The so-called persistence of profits literature, which examines the dynamics of profits, has increased steadily since the seminal contributions of Mueller (1976, 1977, 1986). Empirically there is strong support for the persistence of profit hypothesis whereas the notion of fully competitive markets is rejected. Today there is a significant body of persistence of profit studies. Studies have been conducted at the industry level, e.g., Mueller (1990), Yurtoglu (2004), Schumacher and Boland (2005) and at the country

level, e.g., Kambhampati (1995) (India), Cubbin and Geroski, (1987) (United Kingdom), and Jenny and Weber (1990) (France). Cross-country comparison studies have also been conducted, e.g., Geroski and Jacquemin (1988), Glen et.al.,(2001) and Goddard et.al.(2005). We add to the literature by providing profit persistence estimates for 19 EU countries, and to our knowledge, the inclusion of such a large number of countries, which enables direct comparisons, has not been performed previously.

The questions as to what extent firms have profit persistence and how the persistence differs between the various EU states is not only an important research theme but has also important policy implications. Through the European integration firms have gained access to markets that were previously unattainable to them in the past decades, which suggests that firms have an opportunity to operate in the new more extensive markets and that the opening of markets may additionally produce increased competition and competitive pressure for the domestic incumbents. Nevertheless, the performance of a firm is still influenced by factors specific to the firm's country of origin, and arguably, convergence to a single market in the EU has not been fully achieved. If this was the case, we would expect same persistence of profit pattern across the single market. According to Geroski and Jacquemin (1988), the variations among the speeds of profit convergence may be due to differences in the strength of anti-trust policies and country specific regulatory systems.

High levels of above or below normal profits are a concern for the policy makers since this implies a systematic misallocation of resources. Markets that are less competitive will exhibit such non-normal profits for a longer time, creating welfare losses. However, if innovations enable firms to withstand the erosion of profits from competition, the welfare effects of the innovation is likely to outweigh the welfare loss caused by the temporal monopoly.

The focus of this paper is on the differences persistence of profits for a sample of 19 EU countries between 1995 and 2013. The study includes 5 538 listed firms and a total number of 53 812 observations. We use simple first order autoregressive model, which maintain comparability to previous studies. First, we run the estimates for firms individually, we then aggregate and report country averages. We run firm-level estimations since the profit persistence has a strong time-series dimension instead of cross-section, together with restrictions imposed by low number of observations for some of the sample countries<sup>2</sup>. We also estimate panel models as a robustness check (not reported). A study that incorporates this many countries, to our knowledge, has not been conducted previously, and thus, this is one of the main contributions of this paper as it enables direct comparisons regarding the competitiveness of the different EU member states. Additionally, we include more than one sector in the analysis, i.e., we impose no restrictions on the industry in which the firm is operating in, to capture the whole a full representation of the economy. Our findings suggest that the competitive forces are relatively weak in for example Greece and whereas they are stronger in UK and in Sweden.

## **II. Competition and Persistence of Profits**

As mentioned, there are two alternative ways to view competition. According to the first perspective, competition is viewed as a process for determining prices and quantities, and the monopoly problem consists of too few sellers who produce insufficient output at excessive prices. Following this perspective, competition policies are built on the inference that the divergence

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<sup>2</sup> This enables us to not having to make restrictions on assumptions for common intercepts or parameters among firms, as well as identify and exclude firms with explosive short-run profit persistence behavior. However, the rank of countries between our table 5 and fixed effects estimations have a correlation of 0.66.

between price and cost are greater in concentrated industries, and thus, welfare losses must be greater in such industries since insufficient amount of goods are traded. A problem with empirical studies following this tradition is that they may be capturing transitory disequilibria phenomena (Mueller, 1977). According to the second alternative, which is a more dynamic view of competition, products can be heterogeneous, and non-price modes of competition prevail. Such markets are better characterized by a competition process where the entry and exit of firms are central components. This view of competition is associated with the Schumpeterian-like model of dynamic competition.

In Joseph Schumpeter's 1934 description of “creative destruction”, firms and entrepreneurs compete with one another by introducing innovations and copying the innovations of others. In an extreme case, a firm’s innovation creates an entirely new industry as the innovator starts as a monopoly earning monopoly profits. This, however, attracts imitators who erode the innovator’s excessive profits until all firms in that market earn profits equal to the competitive norm. Thus, under this dynamic view of competition, the entry and exit of firms drives excess profits to zero in the long run. Since this dynamic view allows for the possibility of differences in profits across firms at any given point in time, studies testing it have concentrated on determining whether these profits persist.

At a general level, a firm’s return to capital can be decomposed in three components (Mueller, 1976): i) competitive return common to all firms ( $c$ ), ii) permanent rent specific to firm  $i$  ( $r_i$ ), and iii) a firm’s specific short-run rent, or quasi rent, ( $s_{it}$ ), expressed as:

$$\pi_{it} = c + r_i + s_{it} \quad (1)$$

In fully competitive markets firms would in the long-run earn profits that are equal to the competitive return ( $c$ ) after a sufficient amount of time but as the



short-run rents are correlated over time, and thus, it may take some time for them to return to the competitive norm. Previous studies have estimated whether the short-run rents ( $s_{it}$ ) erode and whether there are significant permanent rents ( $r_i$ ). Following Mueller (1977, 1986), the empirical model to estimate the persistence of profits can be formulated following simple first order autoregressive model<sup>3</sup>:

$$\pi_{it} = \alpha + \lambda_i \pi_{it-1} + u_{it} \quad (2)$$

where  $\pi_{it}$  is measured as the deviation from the mean<sup>4</sup>,  $\pi_{it-1}$  is the profit of the previous period and  $u_{it}$  is the conventional error term. The coefficient  $\lambda_i$  is the speed of adjustment measure, i.e. the short-run profit persistence parameter. The profits are therefore typically dependent on their past values with a mean reverting process.<sup>5</sup>

Equation 2 yields two measures of the persistence of profits in which the short-run estimate is of our main interest. First, the coefficient  $\lambda_i$ , indicates the speed of convergence to the normal level of profits in the short run, i.e., the short-run profit persistence. A value close to zero implies that the competitive process erodes the excess profits within the period. A value close to one indicates that the profits do not erode within the period and that competition has failed to affect the persistence of profits. Second, the firm specific permanent rent is estimated as  $\hat{p}_i = \hat{\alpha}_i / (1 - \hat{\lambda}_i)$ . It indicates the steady-state equilibrium value towards which the profits converge. If  $\hat{p}_i = 0$ , the permanent rent equal the competitive norm and there are no long-run excess profits. Since we have a relatively short period of data availability, we focus on the short-run estimates. However, we provide the share of firms with  $\hat{\alpha}_i$ , and therefore  $\hat{p}$ ,

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<sup>3</sup> In the literature, some have modelled the profit persistence as up to Autoregressive process of order four as stated in tables 1 and 2.

<sup>4</sup>  $\pi_{it} = \text{return on assets}_{i,t} - \sum_i^N \text{return on assets}_{i,t} / \text{Number of firms}_t$ . By subtracting the mean the cyclical component of profits are removed

<sup>5</sup> The parameter can also be of explosive nature where the profits do not converge to a norm. For an extensive description of the model, see Mueller (1986,1990)

significantly different from zero in a given country, as it measures the degree of permanent firm specific rents.

### Previous Literature

The dynamic view of industry competition proposes that in a competitive market normal profits will emerge in the long run as the result of the response to the entry and exit of firms and this has been tested by many during the past decades. In Table 1, previous empirical literature conducted for countries outside of Europe is summarized, whereas Table 2 summarizes the studies of European economies. The last column, mean  $\hat{\lambda}_i$  presents the short-run estimates reported in each study or if not readily available, calculated by the authors based on the study. The estimations reported on table 1 and 2 are based both on individual firm estimations as well as panel estimations. We refer the reader to the individual studies for details. Our findings suggest that results are similar but that panel estimates of  $\hat{\lambda}_i$  gives somewhat higher values.

Table 1. Previous Empirical Literature (outside of Europe)

| Author                      | Country | Sample period | Estimate | No. of firms     | Mean $\hat{\lambda}_i$ |
|-----------------------------|---------|---------------|----------|------------------|------------------------|
| Mueller (1977)              | US      | 1949-73       | AR(1)    | 472              | -                      |
| Mueller (1986)              | US      | 1950-72       | AR(1)    | 600              | 0.493                  |
| Odagiri and Yamawaki (1986) | Japan   | 1964-80       | -        | 294              | -                      |
| Yamawaki (1989)             | Japan   | 1964-82       | AR(1)    | 376              | 0.49                   |
|                             | US      | 1964-80       | AR(1)    | 413              | 0.48                   |
| Mueller (1990)              | US      | 1950-72       | AR(1)    | 551              | 0.18                   |
| Kessides (1990)             | US      | 1967-82       | AR(1)    | 344 <sup>1</sup> | 0.43                   |
| Khemani and Shapiro (1990)  | Canada  | 1964-82       | AR(1)    | 129              | 0.36                   |
|                             |         | 1968-82       | AR(1)    | 161              | 0.30                   |
| Odagiri and Yamawaki (1990) | Japan   | 1964-82       | AR(1)    | 376              | 0.46                   |
| Kambhampati (1995)          | India   | 1970-85       | AR(1)    | 42 <sup>1</sup>  | -                      |

|   |             |           |                  |                  |      |
|---|-------------|-----------|------------------|------------------|------|
| Waring (1996)                           | US          | 1970-89   | AR(1)            | 128              | -    |
| McGahan and Porter (1999)               | US          | 1981-94   | AR(1)            | 4 488            | 0.54 |
| Glen et al., (2001)                     | Brazil      | 1985-95   | AR(2)            | 56               | 0.13 |
|   | India       | 1982-92   | AR(2)            | 40               | 0.22 |
|   | Jordan      | 1980-94   | AR(2)            | 17               | 0.35 |
|   | Malaysia    | 1983-94   | AR(2)            | 62               | 0.35 |
|   | Mexico      | 1984-94   | AR(2)            | 39               | 0.22 |
|   | South-Korea | 1980-94   | AR(2)            | 82               | 0.32 |
|   | Zimbabwe    | 1980-94   | AR(2)            | 40               | 0.42 |
| Maruyama and Odagiri (2002)             | Japan       | 1964-97   | AR(1)            | 357              | -    |
| Yurtoglu (2004)                         | Turkey      | 1985-98   | AR(1)            | 172              | 0.38 |
| Gschwandtner (2005)                     | US          | 1950–99   | AR(4)            | 85               | 0.34 |
|   |             |           |                  | 72               | 0.23 |
| Schumacher and Boland (2005)            | US          | 1980-2001 | AR(1)            | 524 <sup>2</sup> | -    |
| Crespo Cuaresma and Gschwandtner (2006) | US          | 1950-99   | AR(1)            | 156              | 0.52 |
| Cable and Gschwandtner (2008)           | US          | 1950–99   | STS <sup>2</sup> | 156              | -    |
| Crespo Cuaresma and Gschwandtner (2008) | US          | 1950-99   | AR(1)            | 105              | 0.47 |
| Gschwandtner (2012)                     | US          | 1950-66   | AR(1)            | 549              | 0.49 |
|   |             | 1967-83   |                  | 899              | 0.42 |
|   |             | 1984-99   |                  | 1059             | 0.36 |
| Gschwandtner and Cuaresma (2013)        | US          | 1950-99   | AR(1)            | 151              | 0.45 |

Table 2. Previous Literature on European Countries

| Author                        | Country        | Sample period | Estimate | No. of firms | Mean $\hat{\lambda}_t$ |
|-------------------------------|----------------|---------------|----------|--------------|------------------------|
| Geroski and Jacquemin (1988)  | France         | 1965–82       | AR(1)    | 55           | 0.41                   |
|                               | Germany West   | 1961–81       | AR(1)    | 28           | 0.41                   |
|                               | United Kingdom | 1949–77       | AR(1)    | 51           | 0.49                   |
| Schwalbach et al., (1989)     | Germany        | 1961-1982     | AR(1)    | 299          | 0.49                   |
| Cubbin and Geroski (1990)     | United Kingdom | 1948-77       | AR(1)    | 239          | 0.48                   |
| Jenny and Weber (1990)        | France         | 1965-82       | AR(1)    | 450          | 0.37                   |
| Schohl (1990)                 | Germany West   | 1961–84       | AR(1)    | 283          | -                      |
| Schwalbach and Mahmood (1990) | Germany        | 1961–82       | AR(1)    | 299          | 0.48                   |

|                                |                |                        |                    |       |      |
|--------------------------------|----------------|------------------------|--------------------|-------|------|
| Goddard and Wilson (1999)      | United Kingdom | 1972–85                | AR(1)              | 335   | 0.59 |
| Goddard et al., (2005)         | Belgium        | 1993-2001<br>(for all) | AR(2)              | 1 348 | 0.49 |
|                                | France         |                        | AR(1)              | 4 620 | 0.34 |
|                                | Italy          |                        | AR(1)              | 2 173 | 0.45 |
|                                | Spain          |                        | AR(2)              | 2 030 | 0.39 |
|                                | United Kingdom |                        | AR(1)              | 1 511 | 0.34 |
| Cable and Jackson (2008)       | United Kingdom | 1968-99                | STS <sup>3</sup>   | 53    | -    |
| Cable and Mueller (2008)       | United Kingdom | 1968-99                | AR(1)              | 4     | 0.70 |
|                                | US             | 1950-99                | AR(1)              | 4     | 0.63 |
| McMillan and Wohar (2011)      | United Kingdom | 1980-2007              | AR(1)              | 57    | 0.61 |
| Hirsch and Gschwandtner (2013) | Belgium        | 1996–2008<br>(for all) | AR(1)<br>(for all) | 841   | 0.11 |
|                                | France         |                        |                    | 2 786 | 0.21 |
|                                | Italy          |                        |                    | 596   | 0.15 |
|                                | Spain          |                        |                    | 1 043 | 0.25 |
|                                | United Kingdom |                        |                    | 228   | 0.30 |
| Hirsch and Hartmann (2014)     | Belgium        | 1996–2008<br>(for all) | AR(1)              | 72    | 0.17 |
|                                | France         |                        |                    | 178   |      |
|                                | Italy          |                        |                    | 228   |      |
|                                | Spain          |                        |                    | 81    |      |
|                                | United Kingdom |                        |                    | 31    |      |

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Notes: Tables based on Goddard and Wilson (1999) and authors own calculations

<sup>1</sup> The unit is the number of industries instead of firms

<sup>2</sup> The unit is the number of business segments instead of firms

<sup>3</sup> STS = structural time series analysis

The majority of the studies both outside and within Europe are based on the analysis of a single industry, with a particular focus on the manufacturing industry. Some exceptions to this are Schumacher and Boland (2005) and Hirsch and Gschwandtner (2013), among a few others, who focus on the food or dairy industry. When comparing the number of firms included in the samples for previous research, the sample sizes for a given country range from a minimum of 4 in Cable and Mueller (2008) to a maximum of 4620 in Goddard et al., (2005). On the other hand, the minimum time period found in previous studies is 9 years in Goddard et al., (2005) and the maximum of 50 in a handful of studies e.g. Gschwandtner (2005). Long time periods are preferred when studying the profit persistence since it might take a considerable amount of time to capture the actual long-run profits. We have

observations for up to 19 firm years for our sample, which in comparison seems to be sufficiently long<sup>6</sup>. However, our sample sizes for each country vary from 9 firms in Slovak Republic to 1825 in the United Kingdom.

There exists a relatively large volume of literature regarding the United States, whereas the majority of the European studies have focused on specific large countries such as Belgium, France, Germany, Italy and the United Kingdom. Glen et al., (2001) and Yurtoglu (2004) study profit persistence in selected emerging countries, whereas e.g. Odagiri and Yamawaki (1986) focus on Japan. However, there is lack of evidence regarding the persistence of profits across the smaller European economies. Additionally, while there exist objectives to create a single European market, it is important to examine the differences in the competitiveness of the European Union member states. Accordingly, we add to the literature by providing evidence for a large sample of 19 countries.

Most previous studies use ordinary least squares (OLS) and measure the profit convergence by using between one and four lags. A few, more recent studies used dynamic panel model estimations, mainly due to insufficient time dimension of their data. Furthermore, as seen from tables 1 and 2, a handful have investigated the properties of profit persistence using structural time series analysis, which do not yield mean convergence values per se ( $\hat{\lambda}_i$ 's). We use OLS with one lagged dependent variable to maintain comparability with most the previous studies.

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<sup>6</sup> The time period does vary amongst firms within a country but on average we have 19 year observations but use 18 years for the estimations since we lose the first year due to adding a lag. .

### III. Data and Empirical Estimation

We use firm level data from Compustat Global Database for 19 EU countries for the time period 1995 to 2013, all of which report annual data. We use returns on assets (RoA) as measure of profits. Our sample consists of 5 538 firms adding to a total of 53 812 observations. Because we allow firms to enter and exit, the number of observations among firms differs, as summarized below in Table 3. Previous studies have largely focused on samples of firms that survive the entire sample period, but this arguably ignores valuable information. Gschwandtner (2005) argues that by analyzing only surviving firms, one might build an artificial stability into the sample, and thus, the exit and entry of firms are an important part of the dynamic adjustment process of the market.<sup>7</sup>

We have not accounted for the possibility of mergers in our sample as data on merger activities are not available. The included firms in our analysis are publicly listed firms in their respective countries. Furthermore, the number of listed firms within a country differs among the sample countries as stated in the previous section and exemplified in table 3. The sampled countries were selected to provide a good representation of both large and small economies in the EU as well as countries whose data are sufficiently available<sup>8</sup>.

We provide extensive representation of the entire economy from including all sectors rather than focusing exclusively on a single sector or industry. However, the manufacturing sector comprises 43-percent of the total observations. This is perhaps since, similar to many previous studies that have focused on this sector, the data for this sector are readily available and the

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<sup>7</sup> This is verified in table A1. where we exclude firms, which have less than 10 years of data.

<sup>8</sup> However, some caution should be shed to the countries with a low number of firms especially for the pooled estimations.

propensity of manufacturing firms to be listed in the stock exchange relative to other sectors. Usual data caveats apply.

Table 3 summarizes the data with respect to the distribution of the data among the sample countries and the data coverage for each country.

Table 3. Descriptive statistics

| Country         | No. of firms | No. of obs.   | Min no. of obs. per firm | Average no. of obs. per firm | Max no. of obs. per firm | Year coverage |
|-----------------|--------------|---------------|--------------------------|------------------------------|--------------------------|---------------|
| Austria         | 106          | 1121          | 3                        | 11                           | 18                       | 1995-2013     |
| Belgium         | 139          | 1427          | 3                        | 10                           | 18                       | 1995-2013     |
| Czech Republic  | 28           | 236           | 3                        | 8                            | 16                       | 1996-2012     |
| Denmark         | 166          | 1649          | 3                        | 10                           | 18                       | 1995-2013     |
| Estonia         | 18           | 173           | 4                        | 10                           | 14                       | 1996-2012     |
| Finland         | 143          | 1639          | 3                        | 12                           | 17                       | 1995-2012     |
| France          | 804          | 8312          | 3                        | 10                           | 18                       | 1995-2013     |
| Germany         | 822          | 8178          | 3                        | 10                           | 18                       | 1995-2013     |
| Greece          | 210          | 2005          | 3                        | 10                           | 17                       | 1995-2013     |
| Hungary         | 27           | 273           | 3                        | 10                           | 16                       | 1995-2013     |
| Ireland         | 85           | 904           | 3                        | 11                           | 18                       | 1995-2013     |
| Italy           | 307          | 3071          | 3                        | 10                           | 18                       | 1995-2013     |
| Netherlands     | 198          | 2039          | 3                        | 10                           | 17                       | 1995-2013     |
| Portugal        | 69           | 716           | 3                        | 10                           | 17                       | 1995-2012     |
| Slovak Republic | 9            | 87            | 3                        | 10                           | 16                       | 1996-2012     |
| Slovenia        | 21           | 249           | 5                        | 12                           | 16                       | 1996-2012     |
| Spain           | 156          | 1769          | 3                        | 11                           | 17                       | 1995-2013     |
| Sweden          | 405          | 3709          | 3                        | 9                            | 18                       | 1995-2013     |
| United Kingdom  | 1825         | 16255         | 3                        | 9                            | 18                       | 1995-2013     |
| <i>SUM</i>      | <i>5 538</i> | <i>53 812</i> |                          |                              |                          |               |

Following the literature, the dependent variable, profit, is calculated as the return on assets' deviation from the sample mean<sup>9</sup>. We trim the return on assets by the 1% and 99% percentiles as well as exclude values that are less than -25. The return on assets is defined as net income over total assets and it is a common measure of profits used in the literature. Accounting profits are arguably suitable to reflect real economic profits, which is discussed in greater

<sup>9</sup> This removes cyclical fluctuations in the profits levels common to all firms and countries.

depth by, among others, Fisher and McGowan (1983) and Long and Ravenscraft (1984).

To measure the convergence process, we add one lagged value of our dependent variable as an explanatory variable. The autoregressive process is of interest and the coefficient of the lagged value provides insight into the competitiveness of the economies in the short term.

We exclude firms with explosive behavior, i.e.,  $|\hat{\lambda}_i| > 1$ , which comprise 7.4 % of the whole data<sup>10</sup>. Additionally, because we have a relatively short time period in our sample, we focus on the short-run estimates of the convergence process but do also report the long-run estimates. The minimum number of observations used in the paper is three, as seen from table 3, because to run the estimations, at least two yearly observations are needed and the first year is always excluded due to the lag. This means that a firm has had to survive for at least three years for it to be represented in our sample.

We estimate equation 2 individually by firms using ordinary least squares and rapport the averages of the estimates by countries. The firm-level estimations are preferred to panel data estimations since we have a relatively short-time period and the profit persistence has a strong time series rather than a cross-section dimension, and we have some countries with low number of firms and observations. As Goddard and Wilson (1999) state, the profit persistence is usually analysed as a time series since the structural model profit persistence is dominated by the impact of past profits. We also, *mutatis mutandis*, estimate panel version of equation 2 (not reported) as a robustness check.

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<sup>10</sup> This is common practice in the literature, since the firms with this explosive behavior imply non-convergence. Also, as we run estimations of firms individually, instead of pooling them in a panel, we can distinguish and exclude these firms.



## IV. Results

We control for firm heterogeneity by performing an OLS on individual firms in Table 4. The four columns after the column with the name of the country in table 4 are the share of firms in the sample whose profit persistence parameters fall within the given interval for that country. The higher the share of firms that fall in the lower range values of  $\hat{\lambda}_i$  for firms, i.e., either -0.5 to 0 or 0 to 0.5, the more competitive the economy is in the short run. The mean convergence parameter,  $\hat{\lambda}_i$ , is calculated as the mean of all the firm's parameters. The last two columns indicate the percentage of firms' short-run convergence parameter  $\hat{\lambda}_i$ , and the intercept term  $\hat{\alpha}_i$ , which are significantly different from zero at the 5-percent level within each country.

Table 4. Results of firm level OLS summarized per country

| Country         | $-1 < \hat{\lambda}_i < -0.5$ | $-0.5 \leq \hat{\lambda}_i < 0$ | $0 \leq \hat{\lambda}_i < 0.5$ | $0.5 \leq \hat{\lambda}_i < 1$ | Firms      | Mean $\hat{\lambda}_i$ | Share of firms with $\hat{\lambda}_i$ different from zero | Share of firms with $\hat{\alpha}_i$ different from zero |
|-----------------|-------------------------------|---------------------------------|--------------------------------|--------------------------------|------------|------------------------|---|--|
| United Kingdom  | 0.08                          | 0.27                            | 0.45                           | 0.23                           | 1825       | 0.173                  | 0.14  | 0.13   |
| Slovenia        | 0.10                          | 0.19                            | 0.43                           | 0.29                           | 21         | 0.204                  | 0.24  | 0.00   |
| Sweden          | 0.05                          | 0.21                            | 0.50                           | 0.24                           | 405        | 0.212                  | 0.15  | 0.17   |
| Hungary         | 0.07                          | 0.33                            | 0.30                           | 0.30                           | 27         | 0.216                  | 0.30  | 0.22   |
| Germany         | 0.05                          | 0.23                            | 0.45                           | 0.27                           | 822        | 0.224                  | 0.18  | 0.09   |
| Belgium         | 0.05                          | 0.23                            | 0.42                           | 0.29                           | 139        | 0.226                  | 0.22  | 0.11   |
| Denmark         | 0.08                          | 0.18                            | 0.48                           | 0.26                           | 166        | 0.237                  | 0.19  | 0.05   |
| Portugal        | 0.03                          | 0.25                            | 0.43                           | 0.29                           | 69         | 0.242                  | 0.14  | 0.19   |
| Ireland         | 0.05                          | 0.22                            | 0.41                           | 0.32                           | 85         | 0.250                  | 0.24  | 0.19   |
| Finland         | 0.03                          | 0.20                            | 0.45                           | 0.31                           | 143        | 0.258                  | 0.21  | 0.15   |
| Italy           | 0.03                          | 0.21                            | 0.47                           | 0.29                           | 307        | 0.268                  | 0.19  | 0.11   |
| France          | 0.04                          | 0.18                            | 0.44                           | 0.34                           | 804        | 0.279                  | 0.24  | 0.10   |
| Czech Republic  | 0.11                          | 0.14                            | 0.25                           | 0.50                           | 28         | 0.284                  | 0.32  | 0.07   |
| Netherlands     | 0.04                          | 0.20                            | 0.41                           | 0.35                           | 198        | 0.295                  | 0.25  | 0.12   |
| Austria         | 0.03                          | 0.21                            | 0.40                           | 0.37                           | 106        | 0.300                  | 0.27  | 0.08   |
| Slovak Republic | 0.00                          | 0.22                            | 0.33                           | 0.45                           | 9          | 0.316                  | 0.22  | 0.00   |
| Spain           | 0.05                          | 0.11                            | 0.38                           | 0.46                           | 156        | 0.369                  | 0.33  | 0.12   |
| Estonia         | 0.00                          | 0.11                            | 0.56                           | 0.33                           | 18         | 0.405                  | 0.22  | 0.17   |
| Greece          | 0.03                          | 0.12                            | 0.36                           | 0.49                           | 210        | 0.408                  | 0.28  | 0.08   |
| <i>average</i>  | <i>0.05</i>                   | <i>0.20</i>                     | <i>0.42</i>                    | <i>0.33</i>                    | <i>291</i> | <i>0.272</i>           | <i>0.23</i>   | <i>0.11</i>  |

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Notes: The number of firms equals 5538 and the number of observations equal 53812. The last column indicates significance at the 5 percent level of the parameter for all the firms in a given country.

Table 4 provides evidence for detangling the effects of low short-term persistence where the United Kingdom emerges as the most competitive economy in the short-term among the sample of European economies. The emergence of Slovenia and Hungary on the top of the list is mainly explained by the distortion of the mean values when not taking the absolute value into consideration and elaborated upon in table 5. There arises evidence that there exist significant short-run profits across the European Union countries as on average 23 percent of firms have coefficients significantly different from zero at the 5 percent. Therefore, the markets are not fully competitive in most of the countries in the short-run. Greece, followed by the Estonia, Spain and Slovak Republic, appear to have the highest short-run profit persistence among our sample. Moreover, it takes more than a year for the initial profits to lose half of their value for these countries.

The last column brings evidence, also found in previous literature, that in general evidence for profits to persist in the long-run. Slovakia and Slovenia are the only exceptions where no significant long-run profits can be found. On average, amongst the sample firms and countries, 10- percent of firms experience either below or above normal long run profits.

However, to compare the mean values of the short-run parameter is problematic when there are negative values together with positive ones since the lowest values of the parameter will drive down the mean value while being a sign of low competition. To investigate in a more robust manner the magnitudes of the mean short-run converge parameters, we reconstruct table 4 so that we account for the absolute values of the short-run parameters.

Table 4. Results of firm level OLS summarized per country

| Country | $0 \leq  \hat{\lambda}_i  < 0.5$ | $0.5 \leq  \hat{\lambda}_i  < 1$ | Firms | Mean $ \hat{\lambda}_i $ | Share of firms with | Share of firms with |
|---------|----------------------------------|----------------------------------|-------|--------------------------|---------------------|---------------------|
|---------|----------------------------------|----------------------------------|-------|--------------------------|---------------------|---------------------|

|                 |             |             |            |              | $\hat{\lambda}_i$ different<br>from zero | $\hat{\alpha}_i$ different<br>from zero |
|-----------------|-------------|-------------|------------|--------------|--|---|
| United Kingdom  | 0.72        | 0.28        | 1825       | 0.359        | 0.14                                     | 0.13                                    |
| Sweden          | 0.71        | 0.29        | 405        | 0.373        | 0.15                                     | 0.17                                    |
| Slovak Republic | 0.56        | 0.44        | 9          | 0.378        | 0.22                                     | 0.00                                    |
| Belgium         | 0.65        | 0.35        | 139        | 0.379        | 0.22                                     | 0.11                                    |
| Portugal        | 0.68        | 0.32        | 69         | 0.379        | 0.14                                     | 0.19                                    |
| Germany         | 0.69        | 0.31        | 822        | 0.380        | 0.18                                     | 0.09                                    |
| Italy           | 0.67        | 0.33        | 307        | 0.384        | 0.19                                     | 0.11                                    |
| Finland         | 0.66        | 0.34        | 143        | 0.391        | 0.21                                     | 0.15                                    |
| France          | 0.62        | 0.38        | 804        | 0.405        | 0.24                                     | 0.10                                    |
| Netherlands     | 0.61        | 0.39        | 198        | 0.411        | 0.25                                     | 0.12                                    |
| Denmark         | 0.66        | 0.34        | 166        | 0.419        | 0.19                                     | 0.05                                    |
| Ireland         | 0.64        | 0.36        | 85         | 0.420        | 0.24                                     | 0.19                                    |
| Austria         | 0.60        | 0.40        | 106        | 0.421        | 0.27                                     | 0.08                                    |
| Hungary         | 0.63        | 0.37        | 27         | 0.423        | 0.30                                     | 0.22                                    |
| Estonia         | 0.67        | 0.33        | 18         | 0.443        | 0.22                                     | 0.17                                    |
| Slovenia        | 0.62        | 0.38        | 21         | 0.443        | 0.24                                     | 0.00                                    |
| Spain           | 0.49        | 0.51        | 156        | 0.480        | 0.33                                     | 0.12                                    |
| Greece          | 0.48        | 0.52        | 210        | 0.496        | 0.28                                     | 0.08                                    |
| Czech Republic  | 0.39        | 0.61        | 28         | 0.530        | 0.32                                     | 0.07                                    |
| <i>average</i>  | <i>0.62</i> | <i>0.38</i> | <i>291</i> | <i>0.417</i> | <i>0.23</i>                              | <i>0.11</i>                             |

Notes: The number of firms equals 5538 and the number of observations equal 53812. The last two columns indicate significance at the 5 percent level of the parameter in question for all the firms in a given country.

The results are more representative for the mean values in Table 5 where the United Kingdom emerges as the most competitive economy in the short-run, as in table 4, among the sample of European economies, followed by Sweden, and Belgium. Slovak Republic seems to be an outlier which can be possibly explained by the low number of firms, since the share of them that lie in the upper tail of the short-run parameter values seems to be larger than in other countries on the top. Firms in the high-degree of convergence economies are not able to maintain above-normal profits for a large extent when it takes less than a year for the value to reach half of its initial value. As expected, the countries with the lowest persistence also have the lowest number of firms with significant coefficients at the five percent level. However, the very

existence of the significant coefficients provide evidence that the markets are not fully competitive even in these countries.

The Czech Republic, followed by Greece, and Spain appear to have the highest short-run profit persistence among our sample. Moreover, it takes more than a year for the initial profits to lose half of their value for these countries. We can additionally see that the bottom five countries on the list have a higher share of firms with parameters between 0.5 and 1, i.e., on average, they exhibit higher persistence.

The countries in the middle of the list exhibit relatively small variations in convergence parameters, with the differences arising for those at the lower and higher end of the distribution. It is further evident that in most economies, excluding the bottom three, have more than half of the firm's parameter values between 0 and 0.5, i.e., at the lower end of the parameter distribution. The lower the rank of the economy, in general, the higher the share of parameters that are significantly different from zero based on a significance level of 5 percent.

As robustness, we add in the appendix an estimation where we exclude firms with less than 10 observations in table A1. As expected, these firms are mainly located in the negative, more volatile, side of the parameter distribution. As noted in the literature and in the previous section, analysing only (or longer) surviving firms creates artificial instability in the data. The firms with low short-run parameter values, i.e.  $-1 < \hat{\lambda}_i < 0$ , are the ones that should by nature exit the market and keeping them brings valuable information of the economies. We also add table A2 where we evaluate the firms with only positive convergence. The rank of the countries in both A1 and A2 are relatively robust, with expected systematically higher mean short-run rent parameter values. We also have evaluated panel estimations, in which the results are in-line with firm-level estimations with upward bias in the estimations, results are available upon request.

However, we are not able to distinguish whether our persistence parameter values are driven by i) vigorous innovating activities or ii) a lack of competition, and therefore, we cannot conclude much regarding the middle-range countries' parameter values other than that they are close to each other. Since we do not study the factors that cause the persistence of these profits, we cannot definitely state what specifically these countries act upon. However, we demonstrate that i) profit persistence differs among the sample countries, ii) which sample countries perform the worst or best in the short run with respect to profit convergence given the time period, and iii) there exists significant long-run permanent rents. More should be done with respect to the underlying reasons why this is so.

## **V. Summary and Policy Implications**

The more competitive a market economy is, the faster profits above or below the norm should be restored to competitive levels. In a competitive milieu, to put it differently, we would expect a low level of profit persistence. Our results indicate that there are economically significant differences in the competitiveness among the EU states in the short-run. We emphasize the results from firm-level estimations since we have some data availability issues which are best addressed by the use of firm-level estimations. In general, the United Kingdom, Sweden and Belgium are the countries with the lowest profit persistence, whereas Czech Republic, Greece, and Spain are appearing to be the least competitive economies with the highest persistence of profits.

Our results also show that there are significant permanent rents present in the European Union countries. The exception to this seems to be Slovakia and Slovenia where we could not identify any significant permanent rents. Besides the above-mentioned countries, the share of firms with significant permanent rents range from minimum of 5% in Denmark to a maximum of

22% in Hungary. However, due to data limitations we are careful about drawing strong inference with regard to the long run persistence of profits.

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## Appendix

Table A1. Results of firm level OLS summarized per country, firms less than 10 observations excluded

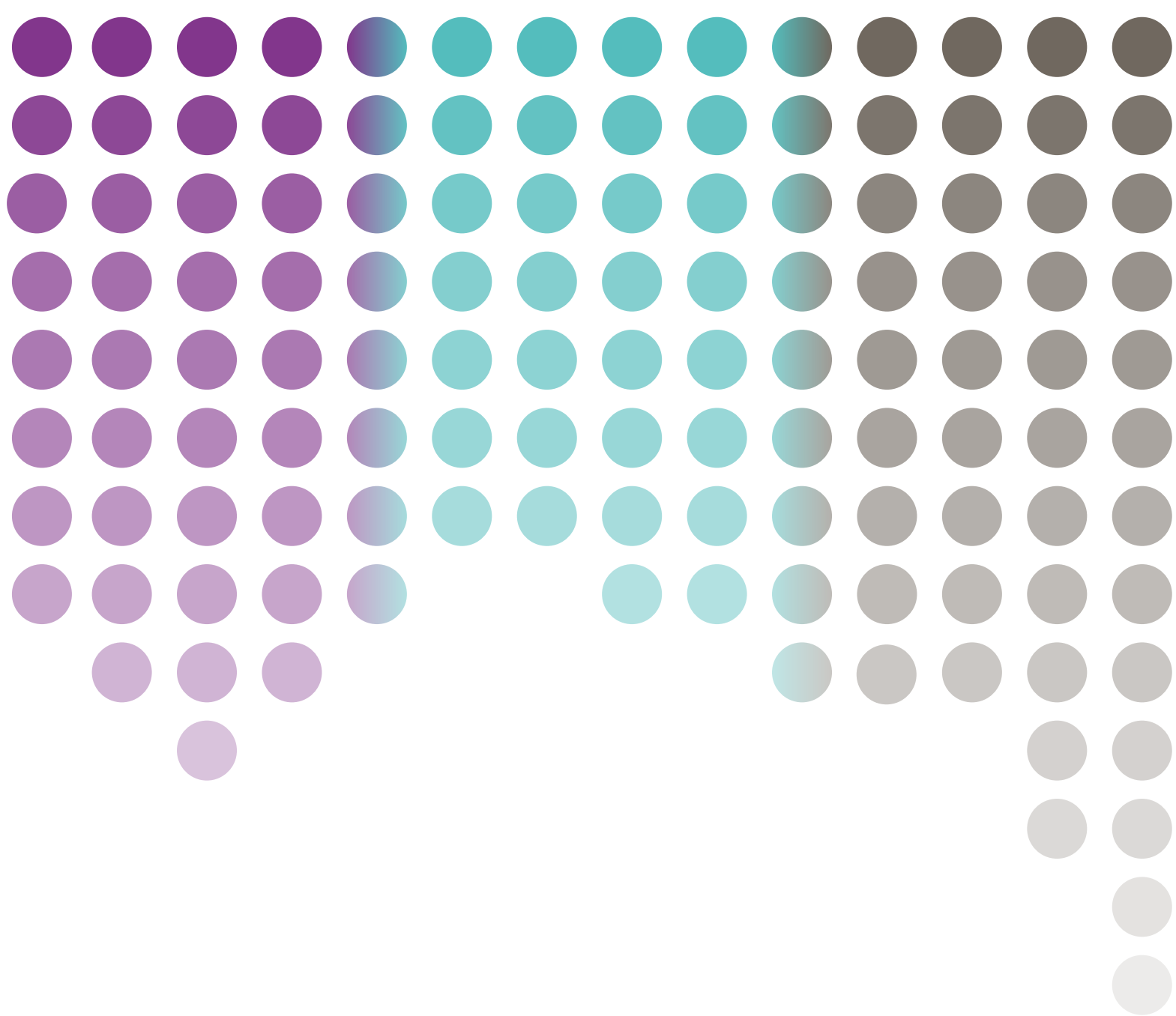
| Country         | $-1 < \hat{\lambda}_i < -0.5$ | $-0.5 \leq \hat{\lambda}_i < 0$ | $0 \leq \hat{\lambda}_i < 0.5$ | $0.5 \leq \hat{\lambda}_i < 1$ | Firms      | Mean $\hat{\lambda}_i$ | Mean $ \hat{\lambda}_i $ | Share of firms with $\hat{\lambda}_i$ different from zero | Share of firms with $\hat{\alpha}_i$ different from zero |
|-----------------|-------------------------------|---------------------------------|--------------------------------|--------------------------------|------------|------------------------|--------------------------|---|--|
| Austria         | 0.00                          | 0.05                            | 0.44                           | 0.51                           | 55         | 0.484                  | 0.499                    | 0.47  | 0.11   |
| Belgium         | 0.00                          | 0.14                            | 0.44                           | 0.42                           | 70         | 0.363                  | 0.417                    | 0.37  | 0.14   |
| Czech Republic  | 0.00                          | 0.20                            | 0.10                           | 0.70                           | 10         | 0.501                  | 0.562                    | 0.60  | 0.20   |
| Denmark         | 0.00                          | 0.06                            | 0.61                           | 0.33                           | 79         | 0.399                  | 0.425                    | 0.30  | 0.08   |
| Estonia         | 0.00                          | 0.00                            | 0.70                           | 0.30                           | 10         | 0.469                  | 0.469                    | 0.30  | 0.20   |
| Finland         | 0.00                          | 0.14                            | 0.47                           | 0.39                           | 92         | 0.353                  | 0.403                    | 0.29  | 0.14   |
| France          | 0.01                          | 0.11                            | 0.44                           | 0.44                           | 431        | 0.398                  | 0.443                    | 0.37  | 0.12   |
| Germany         | 0.00                          | 0.16                            | 0.52                           | 0.32                           | 400        | 0.315                  | 0.373                    | 0.30  | 0.13   |
| Greece          | 0.00                          | 0.08                            | 0.29                           | 0.63                           | 99         | 0.531                  | 0.552                    | 0.48  | 0.09   |
| Hungary         | 0.07                          | 0.16                            | 0.31                           | 0.46                           | 13         | 0.378                  | 0.557                    | 0.54  | 0.15   |
| Ireland         | 0.00                          | 0.14                            | 0.44                           | 0.42                           | 43         | 0.406                  | 0.453                    | 0.40  | 0.23   |
| Italy           | 0.01                          | 0.13                            | 0.48                           | 0.38                           | 158        | 0.348                  | 0.399                    | 0.31  | 0.13   |
| Netherlands     | 0.00                          | 0.14                            | 0.38                           | 0.48                           | 103        | 0.371                  | 0.448                    | 0.41  | 0.16   |
| Portugal        | 0.00                          | 0.16                            | 0.60                           | 0.24                           | 37         | 0.282                  | 0.338                    | 0.22  | 0.30   |
| Slovak Republic | 0.00                          | 0.00                            | 0.46                           | 0.66                           | 3          | 0.432                  | 0.432                    | 0.66  | 0.00   |
| Slovenia        | 0.06                          | 0.18                            | 0.41                           | 0.35                           | 17         | 0.267                  | 0.468                    | 0.29  | 0.00   |
| Spain           | 0.00                          | 0.05                            | 0.41                           | 0.54                           | 96         | 0.492                  | 0.502                    | 0.49  | 0.15   |
| Sweden          | 0.01                          | 0.12                            | 0.54                           | 0.33                           | 171        | 0.354                  | 0.397                    | 0.30  | 0.22   |
| United Kingdom  | 0.01                          | 0.16                            | 0.53                           | 0.30                           | 696        | 0.311                  | 0.370                    | 0.29  | 0.20   |
| <i>average</i>  | <i>0.01</i>                   | <i>0.12</i>                     | <i>0.45</i>                    | <i>0.43</i>                    | <i>136</i> | <i>0.392</i>           | <i>0.448</i>             | <i>0.39</i>   | <i>0.14</i>  |

Notes: The number of firms equals 2583 and the number of observations equal 36426. The last two columns indicate significance at the 5 percent level of the parameters for all the firms in a given country. Firms with less than 10 yearly observations are excluded.

Table A2. Results of firm level OLS summarized per country  
with only positive convergence

| Country         | $0 < \hat{\lambda}_i < 0.5$ | $0.5 \leq \hat{\lambda}_i < 1$ | Firms      | Mean $\hat{\lambda}_i$ | Share of firms with $\hat{\lambda}_i$ different from zero | Share of firms with $\hat{\alpha}_i$ different from zero |
|-----------------|-----------------------------|--------------------------------|------------|------------------------|---|--|
| United Kingdom  | 0.67                        | 0.33                           | 1235       | 0.393                  | 0.20  | 0.12   |
| Sweden          | 0.67                        | 0.33                           | 301        | 0.394                  | 0.20  | 0.12   |
| Germany         | 0.63                        | 0.37                           | 594        | 0.418                  | 0.25  | 0.07   |
| Belgium         | 0.59                        | 0.41                           | 100        | 0.420                  | 0.29  | 0.08   |
| Portugal        | 0.61                        | 0.39                           | 51         | 0.420                  | 0.20  | 0.14   |
| Finland         | 0.60                        | 0.40                           | 109        | 0.426                  | 0.26  | 0.08   |
| Italy           | 0.62                        | 0.38                           | 234        | 0.428                  | 0.24  | 0.07   |
| France          | 0.57                        | 0.43                           | 623        | 0.442                  | 0.30  | 0.08   |
| Denmark         | 0.65                        | 0.35                           | 123        | 0.443                  | 0.25  | 0.04   |
| Slovak Republic | 0.43                        | 0.57                           | 7          | 0.446                  | 0.29  | 0.00   |
| Slovenia        | 0.60                        | 0.40                           | 15         | 0.453                  | 0.33  | 0.00   |
| Ireland         | 0.56                        | 0.44                           | 62         | 0.459                  | 0.32  | 0.13   |
| Netherlands     | 0.54                        | 0.46                           | 152        | 0.46                   | 0.32  | 0.10   |
| Austria         | 0.52                        | 0.48                           | 81         | 0.472                  | 0.36  | 0.06   |
| Estonia         | 0.62                        | 0.38                           | 16         | 0.477                  | 0.25  | 0.19   |
| Spain           | 0.46                        | 0.54                           | 131        | 0.506                  | 0.40  | 0.11   |
| Greece          | 0.42                        | 0.58                           | 179        | 0.530                  | 0.32  | 0.04   |
| Hungary         | 0.50                        | 0.50                           | 16         | 0.539                  | 0.44  | 0.06   |
| Czech Republic  | 0.33                        | 0.67                           | 21         | 0.543                  | 0.43  | 0.05   |
| <i>average</i>  | <i>0.56</i>                 | <i>0.44</i>                    | <i>213</i> | <i>0.456</i>           | <i>0.30</i>   | <i>0.08</i>  |

Notes: The number of firms equals 4050, and the number of observations equal 43026. The last two columns indicate significance at the 5 percent level of the parameters for all firms in a given country. Firms with  $\hat{\lambda}_i$  parameter below zero and above 1 are excluded.



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