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ENTERPRISE PRODUCTIVITY A THREE-SPEED EUROPE

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Abstract

Between 2003 and 2008 productivity patterns diverged between the fast growing, newest members of the European Union and the slower paced, elder ones – as would be expected. However, there are also striking divergences within the latter group, with productivity in Southern Europe going into reverse. This paper analyzes which factors - whether country-level or firm-specific ones - contributed more to the emergence of a three-speed Europe. The analysis combines firm-level data with country-level inputs. Among the newest members of the European Union, country characteristics including the stock of inward foreign direct investment, the availability of credit, and the quality of the business environment and the skills of the workforce prove to be the most important drivers. Firm specific characteristics are shown to matter as well, notably that small firms and firms which are part of international groups realize more productivity gains than larger domestic competitors. Among the more advanced member countries, firm-level characteristics are most important, with larger firms and firms with international affiliation demonstrating faster productivity gains. Country specific factors, such as the quality of the business environment, the size of outward FDI and the skills of the workforce, do matter as well. These explanations of diverging productivity patterns suggest that European Union nations can realize significant benefits from low cost policy interventions such as improving business regulations and encouraging firms' internationalization.

Key words: productivity, regulation, firm performance, foreign direct investment, global value chains, firm characteristics, Doing Business, European Union.

JEL: D22, H11, O47, O52

Non-technical summary

The first decade of the 21st century witnessed significant structural changes throughout Europe, including the introduction of the Euro, the expansion of the European Union, and the acceleration of globalization. Despite these common shocks, the member countries of the EU evidence widely disparate responses in productivity growth. Some countries took advantage of these changes to upgrade technology, adopt new management processes, and learn from their more productive neighbors through the flow of capital, labor, and goods, while others lagged behind. In particular, the twelve newest members of the European Union (EU12) experienced vigorous productivity growth, three to four times higher than the growth of the fifteen prior members of the European Union (EU15). However, as New Europe raced to catch up with Old, the southernmost states of Western Europe fell drastically behind, actually experiencing productivity contractions.

This paper sheds light on the factors that led to these disparate outcomes across members of the European Union in the 2003-08 period. Using a unique dataset combining firm-level data on productivity and firm characteristics and country-level data on basic macro, infrastructure and business environment indicators, this paper tries to disentangle the effects of country and firm-level factors on productivity performance to answer the policy question of what countries may do to encourage greater productivity growth. In this regard this paper is relevant and complementary to the work CompNet is mandated to as it brings new evidence on the drivers of productivity in EU countries and firms, and discuss how such indicators relate to policy outcomes.

Results show that among the newest members of the European Union, country characteristics including the stock of inward FDI, the availability of credit, and the quality of the business environment and the skills of the workforce prove to be the most important drivers. Firm specific characteristics are shown to matter as well, notably that small firms and firms which are part of international groups realize more productivity gains than larger domestic competitors. These results suggest that accession to the EU has been beneficial for new members because the ease with which foreign firms may now penetrate these new markets has facilitated the transfer of technology and the diffusion of best practices. The clear policy implication is that developing countries may realize significant productivity gains by taking the relatively easy steps of improving their regulatory regimes and creating environments attractive to inward FDI before addressing the more costly requirements of improving infrastructure and better educating their workforces.

Among the EU15 members, a mixed picture has emerged. For the more advanced member countries, firm-level characteristics are most important, with larger firms and firms with international affiliation demonstrating faster productivity gains. Country specific factors, such as the quality of the business environment, the size of outward FDI and the skills of the workforce, do matter as well. Taken together, these results suggest that multinational corporations might have a role in driving productivity growth in developed countries. Meanwhile, our analysis suggested that productivity losses experienced by Greece, Italy, Portugal, and Spain may be attributed to disadvantageous and restrictive regulatory regimes, leading to a relative preponderance of small- and medium-size firms. These factors discourage international participation and sharply limit the EU15 South's ability to benefit from knowledge transfers from abroad, economies of scale, and production-reallocation efficiencies.

Overall, these explanations of diverging productivity patterns suggest that European Union nations can realize significant benefits from low cost policy interventions such as improving business regulations and encouraging firms' internationalization.

Introduction and Main Findings

Between 2002 and 2008, the European Union (EU) experienced significant structural changes, including the introduction of the Euro, the 2004 expansion, and the proliferation of international business linkages worldwide. In parallel with this process, substantial changes took place including technological upgrades, adoption of new management processes, and regulatory reform.[2] Against this backdrop, firms in the twelve newest members of the European Union (EU12, the "New Europe")[3] experienced vigorous productivity growth, three to four times greater than the growth of the fifteen elder members of the European Union (EU15, the "Old Europe")[4]. However, as New Europe raced to catch up with Old, the southernmost states of Western Europe fell drastically behind, and experienced productivity contractions. What factors led to these disparate outcomes? This paper disentangles the effects of country- and firm-level variables on productivity to answer the policy question of what countries may do to encourage greater productivity growth.

Recent research efforts have revealed extensive heterogeneity in productivity growth across countries and sectors, even within narrowly defined industries.[5] We use the 2010 Amadeus database,[6] which provides firm-level data on employment, sector, age, and international affiliations.[7] We augment this with country-level business environment indicators from the Doing Business (DB) database, foreign direct investment (FDI) data from Eurostat, infrastructure quality indicators from the Global Competitiveness Report, credit availability and workforce education data from the World Development Indicators (WDI). Using ordinary least squares (OLS) regression, we estimate the contribution of each factor to productivity growth between 2003 and 2008, both individually and as sets of either firm- or country-level variables.

For the EU12, country-level characteristics contribute the most toward explaining productivity growth. Of the variables included, the most influential are DB indices of government business regulation, the stock of inward foreign direct investment, the availability of credit and the education of the workforce. Firms with international owners or affiliates grew significantly faster than purely domestic firms.[8] These two effects suggest that government policies promoting FDI might have an impact in productivity growth. The results are similar for manufacturing and services.

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[2] Aghion, Acemoglu, and Zilibotti (2006).

[3] The EU12 consists of Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, and Slovenia. However, Cyprus and Malta are excluded from the analysis due to lack of data.

[4] The EU15 consists of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. However, Luxembourg and Ireland are excluded from the analysis due to lack of data.

[5] For surveys of the literature, see Wagner (2007); Foster, Haltiwanger, and Krizan (2001); Bartelsman, Haltiwanger, and Scarpetta (2004); Barba Navaretti and Venables (2004).

[6] Amadeus is a comprehensive firm-level database containing financial information for over 11 million public and private companies throughout Europe produced from the Bureau van Dijk

[7] Using information related to business groups, we identify purely firms and groups operating purely in domestic markets, domestic subsidiaries of international groups and global headquarters.

[8] This result is common in the literature. See Dunne, Roberts, and Samuelson (1989); Ilmakunnas and Maliranta (2004); Smarzynska and Javorcik (2004).

Among the EU15, firm-level variables are the most important determinants of productivity—specifically, firm size and ownership. Smaller firms grow more quickly than large ones. Meanwhile, foreign-affiliated firms show much greater productivity gains compared with purely domestic firms: global headquarters grow most quickly, followed by domestic subsidiaries. Firm age does not appear significant to explain productivity growth in manufacturing, but older firms in services appear to have a productivity advantage over younger ones.

Of the country-level variables, the quality of government regulation, outward FDI and workforce education explain much of the variation across member nations, indicating that policy again plays a significant role in productivity growth.

The results above can be used to explain the productivity pattern for the EU15 southern economies —Greece, Italy, Portugal, and Spain (EU15 South)— which stand out as exceptions to the general European trend toward productivity growth. According to the results, the falling productivity between 2003 and 2008 is most likely explained by a distribution of firms skewed toward small and domestic producers, a limited degree of firms' internationalization and regulatory regimes disadvantageous to the expansion of private industry.[9] The three factors above appear to be correlated. Burdensome regulations constrain the growth of private businesses, as confirmed by the correlation between the number of microfirms and the quality of government regulation. At the same time, small firms are less likely to expand abroad, as evidenced by EU15 South's lower rates of outward FDI, and are less attractive FDI target. This situation in turn reduces these states' ability to benefit from technology and knowledge transfers, accordingly reducing their potential for productivity gains.

A key policy implication of this paper is particularly relevant at a time of fiscal consolidation: improving government regulation (and encouraging FDI) might help lagging European countries catch up to their neighbors. These policies have limited costs and faster impact than corresponding investments in infrastructure and education.

The remainder of the paper is organized as follows. Section 2 provides motivation and a survey of the current literature. Section 3 describes the data in detail, while Section 4 explains the methodology of the analysis. Section 5 contains a discussion of the results, broken up into three subsections. The first section describes the results for the EU12, the second for the EU15, and the third discusses the EU15 South. Section 6 concludes and offers suggestions for future research.

1. Motivation and Related Literature

The persistence of productivity differences—measured as either labor productivity or total factor productivity—across firms, even within narrowly defined industries, has inspired extensive research into its causes.[10]

At the national level, economists have posited explanations of productivity differences based on the country's business environment determined by government regulation, taxation, industrial support, and openness to international trade and FDI. Based on a set of twelve Organisation for Economic Co-operation and Development (OECD) countries and using industry-level data, Nicoletti and Scarpetta (2003) find that restrictive regulation in manufacturing tends to reduce multifactor productivity (MFP) growth. The authors suggest

[9] See Ateriodo, Hallward-Driemeier, and Carmen (2007).
[10] Foster, Haltiwanger, and Krizan (2001) provide a seminal and rich review of the literature on productivity dynamics. This paper focuses on firm- and country-level variables. For analysis using product-level variables, see Bernard, Redding, and Schott (2006).

that such restrictive regulations reduce competitive pressures to invest in productivity-enhancing technologies. Using related approaches, Conway et al. (2006) and Arnold, Nicoletti, and Scarpetta (2008) reach similar conclusions for European countries, especially for technology-driven productivity improvements.[11] This paper expands on these results by including eleven more European countries, controlling for more country- and firm-level factors, and employing a resampling technique to ensure that the sample accurately reflects the population.

Wagle (2010) investigates the effects of regulation on FDI and concludes that FDI-increasing regulations prompt beneficiary firms to grow more quickly, through either selection effects or knowledge transfers.[12] This paper tests for these effects using business environment variables.

Burda and Hunt (2001) take a different approach, investigating the effects on productivity when countries integrate their economies. They find evidence that less productive members of economic unions benefit from productivity transfers from their partners.[13] Winston (1993), Harrison (1994), and Meyer and Vickers (1997) suggest that integration improves productivity growth by increasing competition. This competition leads to the expectation of convergence. This paper considers both integration and international affiliations.

The effects of firm size, age, and ownership structure on labor-productivity growth are also analyzed in the paper.[14] Dunne, Roberts, and Samuelson (1989), using a dataset including 200,000 U.S. manufacturing firms from 1967–1977, find that size is negatively correlated with growth, and that the expected growth rate of a firm declines with size for firms owned by single-plant firms, but increases with size for firms owned by multi-plant firms, suggesting synergies from FDI. The importance of FDI for growth is a persistent result throughout the literature,[15] and one further supported by the current findings.

The research most similar to that presented in this paper is the work of Anos Casero and Udomsaph (2009). The authors show a direct correlation between productivity growth and the quality of institutions and government policies. They also use the Amadeus dataset and employ principal component analysis (PCA) to evaluate the quality of the business environment. However, their analysis covers only eight European countries, and their sample

[11] These studies use the framework proposed by Aghion and Griffith (2005) in which productivity growth within a country/sector is calculated in relation to the pace of the country/sector leader. This growth, in turn, depends on the business environment and policies in the follower country, especially those policies that promote firm rivalry and market entry. Arnold, Nicoletti and Scarpeta (2008) use firm-level data and focus on MFP growth. Nicoletti and Scarpetta (2003) also measure MFP but use industry-level information, while Conway et al. (2006) use industry-level data but measure labor productivity growth. All of these studies rely on OECD country samples.

[12] For more on FDI and growth, see Barba Navaretti and Venables (2004), Bernard and Jensen (1995), and Vogel and Wagner (2009).

[13] Specifically, Burda and Hunt (2001) suggest five mechanisms for productivity transfers: (1) capital accumulation, (2) migration, (3) FDI, (4) Hecksher-Ohlin factor price equalization, and (5) knowledge/technology spillovers. See also Ackerlof et al. (1991).

[14] There has been considerable disagreement among studies as to the causes of productivity growth. On one hand, using a panel of fourteen OECD countries for 1970–1987, Bernard and Jones (1993) find growth in total factor productivity (TFP) due to within-firm technological improvement and capital accumulation. Olley and Pakes (1996) and Restuccia and Rogerson (2007), on the other hand, find that productivity gains are primarily the result of reallocation of resources to high-productivity firms from low. Still other studies have found net entry to be the most influential motor.

[15] Wagner (2011) suggests several pathways by which firms may benefit from inward FDI, including knowledge transfers and spillover effects. See Smarzynska Javorcik (2004) for growth effect from outward FDI on domestic firms in Lithuania; Barba Navaretti and Venables (2004) for a survey of empirical studies on productivity differences between foreign owned firms and domestic firms.

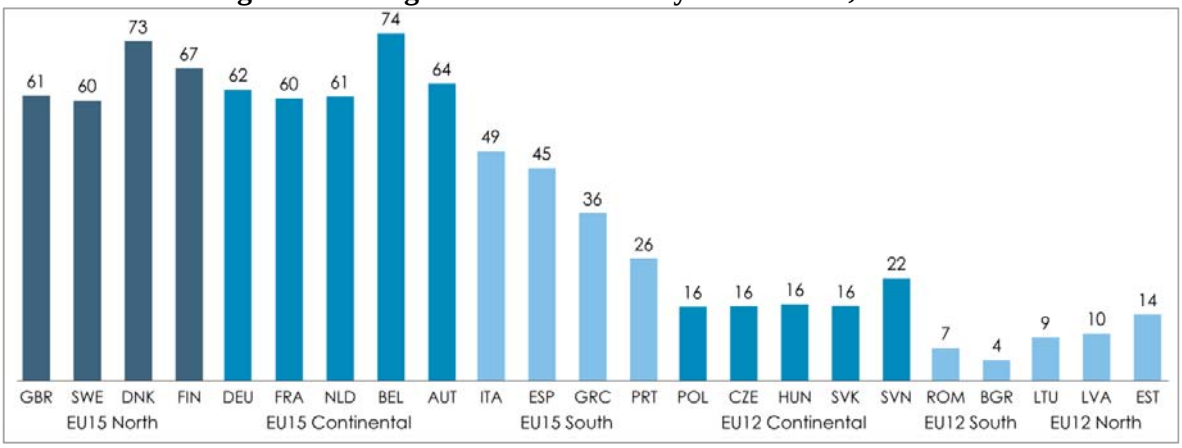
is driven by the data availability in Amadeus.[16] The resampling techniques used in this paper and the use of a larger universe of countries and firms improve upon that analysis.

In summary, in this paper we hope to offer several novel additions to the literature. First, there is the use of the Amadeus database in conjunction with a resampling technique to represent the underlying population and generate a representative, cross-country sample. Second, the paper combines firm/ industry-, and country-level variables to form conclusions about the relative importance of these different levels of analysis. Finally, the inclusion of the DB business environment variables – through a principal component analysis – provides clear policy implications on how to improve productivity growth via regulatory reforms.

2. Data

Figure 1 and Figure 2 describe the average productivity levels and their growth rates for the twenty seven EU member countries over the period 2002–2008.[17] While in 2002 the average productivity in the EU12 was much lower than in the EU15, the laggards countries realized much greater increases in labor productivity through 2008. However, the Southern countries in the EU15 South performed exceptionally weakly: Greece, Italy and Spain suffered negative productivity growth over the relevant period, while Portugal only realized a marginal productivity improvement.

Figure 1 Average Labor Productivity in the EU27, 2002



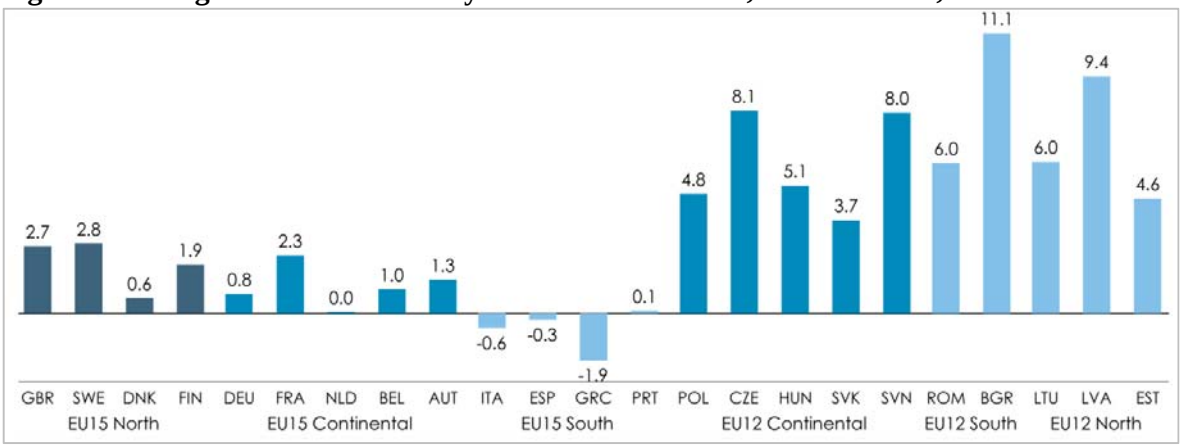
Source: World Bank staff calculations based on Eurostat.
Note: Labor productivity is defined as value-added per employee. For Belgium and Greece, productivity levels are from 2003. Data are in thousands of 2005 U.S. dollars. The following sectors are included: manufacturing, wholesale/retail trade, hotels/restaurants, transport/communications, and real estate/business services.

This paper would like to gain an understanding of the factors behind such disparate outcomes. The analysis is based on firm-level data from the Amadeus database. For each firm, the following variables are extracted: total number of employees,[18] as an indicator of firm size; sector (NACE 1.1 digit) to determine the firm's primary economic activity; year of registration to establish the firm's age; and the global ultimate owner of the firm, to identify

[16] Over half of the firms included into the sample are from Romania.
[17] The aggregate figures on labor productivity growth presented in this paper are based on the Eurostat Structural Business Statistics database (SBS) for contestable sectors, with the exclusion of construction. As such, these data do not exactly mirror the aggregations presented in Table 1, which rely on WDI/International Labour Organization (ILO) data and include mining, energy utilities, financial intermediation, government, and other services, such as education and health. In addition, the data from SBS and ILO reflect different time periods: 2002–2008 and 1995–2009, respectively.
[18] The reported number of employees includes all part-time and full-time employees, both temporary and permanent.

the firm's ownership structure. Data on value-added[19] also from Amadeus, are used as a company performance indicators.[20] Productivity is then defined as value-added per employee (labor productivity). The analysis was restricted to labor productivity for two reasons. First, the labor measure is directly observable at the firm level. Second, it avoids the bias arising from the simultaneity between productivity and inputs encountered with total factor productivity (TFP) estimations.[21]

Figure 2 Average Labor Productivity Growth in the EU27, Annual Rates, 2002–2008



Source: World Bank staff calculations based on Eurostat.
Note: The time period considered varies by country: Belgium (2003–08), Greece (2003–07), and Great Britain, France, Czech Republic, Latvia, and Romania (2002–07). The following sectors are included: manufacturing, wholesale/retail trade, hotels/restaurants, transport/communications, and real estate/business services.

Although Amadeus constitutes a rich and detailed database, its coverage is skewed in favor of large firms, thereby underestimating the distribution with regards to small businesses. A re-sampling technique was used based on which random draws are taken for each size-sector-country stratum according to the true population of firms based on Eurostat (Appendix III provides a detailed description of the re-sampling methodology). Even after re-sampling, the country coverage differs widely: according to the ratio between the targeted number of companies (in the population) and the number of sampled firms for this reason, two different samples are obtained: sample 1 contains firms with at least 10 employees, covers fewer countries, but has more firms; Sample 2 contains firms with at least 50 employees, covers more countries, but fewer companies.[22] Given that firms are only removed from Amadeus after at least five years of non-reporting, [23] it is therefore impossible to distinguish between firms that exit the dataset due to insolvency and those which exit for some other reason, such as merger. To address this limitation, the analysis focuses on a balanced sample of surviving

[19] Value-added is defined in Amadeus as profit plus depreciation, taxation, interest payments, and employment costs.
[20] Value-added figures were denominated in nominal local currencies. These values were deflated using gross domestic product deflators constructed using United Nations Economic Commission for Europe (UNECE) data according to the following sector aggregations: i) manufacturing; ii) wholesale & retail trade, repairs, hotels & restaurants, transport & communications; and iii) real estate, renting & business activities (see UNECE *Statistical Database*. http://w3.unece.org/pxweb/). The obtained figures were converted to 2005 U.S. dollars using annual average exchange rates provided by the WDI dataset (World Bank. *World Development Indicators*. http://databank.worldbank.org).
[21] See Dachs, Ebersberger, and Lööf (2008).
[22] See Appendix III for more details on how these samples were defined.
[23] Firms that stop reporting their financial statements are represented as "not available/missing" for four years following the last available filing.

firms, i.e. firms present for the entire date range.[24] Another limitation of the Amadeus dataset is that it contains financial statement data and as such it does not allow measuring the availability of bank credit at individual firm's level. As such the analysis will not be able to measure the direct impact of access to finance on firm productivity. To compensate this shortfall, the analysis will rely on macro indicators to measure the availability of bank lending at country level.

Table 1 shows the sample compositions and compares the aggregate productivity growth from the micro-level data with the aggregate ones from Eurostat.[25] The comparison suggests that the samples mirror productivity trends at the macro level, lending credence to the use of micro data to explain macroeconomic growth.[26]

Table 1 Aggregate Annual Productivity Growth, 2002–2007: Amadeus[27] and Eurostat data

	Sample 1 (10+ employees)					Sample 2 (50+ employees)				
	Obs	Manufacturing		Services (w/o construction)		Obs	Manufacturing		Services (w/o construction)	
EU12		**Amadeus**	**Eurostat**	**Amadeus**	**Eurostat**		**Amadeus**	**Eurostat**	**Amadeus**	**Eurostat**
Bulgaria	-	-	12.81%	-	9.75%	256	9.20%	13.66%	8.10%	8.18%
Czech Rep.	2,410	6.00%	8.22%	6.20%	5.65%	532	6.80%	8.42%	7.30%	5.71%
Estonia	561	9.10%	10.76%	8.70%	6.41%	85	6.80%	10.47%	6.50%	3.70%
Poland	3,811	3.20%	1.14%	7.20%	4.28%	1,267	1.20%	0.37%	2.10%	3.75%
Romania	4,249	5.90%	7.47%	2.80%	4.84%	853	5.30%	8.44%	5.50%	5.03%
Slovak Rep.	-	-	9.60%	-	1.66%	196	8.40%	9.87%	15.30%	1.28%
Slovenia	526	5.70%	10.49%	2.80%	6.34%	104	6.40%	10.04%	5.60%	1.26%
EU15										
Belgium	2,485	1.60%	2.89%	0.80%	0.54%	366	2.70%	3.46%	1.50%	0.40%
Finland	1,036	11.10%	7.03%	4.80%	2.92%	147	4.30%	7.02%	9.80%	2.78%
France	15,029	4.40%	3.89%	2.60%	1.10%	2,322	3.70%	3.77%	4.80%	0.41%
Germany	-	-	3.38%	-	0.99%	2,733	2.50%	3.67%	2.20%	1.58%
Great Britain	-	-	3.61%	-	3.21%	2,408	3.00%	3.76%	1.20%	3.68%
Italy	17,143	2.40%	1.92%	1.90%	0.73%	1,788	1.10%	1.99%	-0.70%	-0.12%
Norway	1,523	-6.60%	-3.90%	5.60%	7.10%	189	2.20%	4.70%	-4.40%	-3.80%
Portugal	-	-	2.85%	-	-0.80%	493	2.70%	3.53%	-2.20%	-2.54%
Spain	16,850	1.50%	1.48%	0.90%	0.14%	1,884	1.10%	1.15%	-1.30%	-0.08%
Sweden	2,436	4.30%	6.03%	2.10%	1.72%	383	4.40%	6.48%	2.50%	1.74%
Total	68,059					16,006				

Source: World Bank staff calculations based on Eurostat and Amadeus

We include several variables to account for country-level variation. From the World Bank's World Development Indicators (WDI) database, we define access to credit as measured by the ratio of domestic credit to private sector to GDP and skills as measured by the percent of the total labor force with tertiary education. Quality of overall infrastructure is measured by an index taken from the Global Competitiveness Report, a survey of business leaders published by the World Economic Forum. [28] Inward and outward stock of foreign direct

[24] As a result, surviving firms are likely to have different productivity level than the underlying population.

[25] The comparison is performed for 2003–2007, the years for which Eurostat and Amadeus overlap.

[26] Appendix I shows the kernel density estimations of annualized growth of labor productivity (2003–2008) for each sample for two regional cuts: EU15 and EU12. Both estimations use the Epanechnikov kernel function with a bandwidth of 0.5. Appendix II presents the corresponding firm-level summary statistics. For both samples, the distribution for EU12 firms is higher than for EU15, suggesting that EU12 firms realized greater productivity growth. A Kolmogorov-Smirnov test for equality of distribution functions rejects the null hypothesis at the 1 percent.

[27] Aggregate productivity in Amadeus is computed as total value-added divided by total number of employees.

[28] World Economic Forum. *Global Competitiveness Report*. http://www.weforum.org/issues/global-competitiveness. As with all indicators available at the Global Competitiveness Report database, the index of "Quality of overall infrastructure" – Index 2.01, under the 2nd pillar "Infrastructure" – varies from 1 to 7; the higher the value the better is the quality of infrastructure.

investment (FDI) are measured as the ratios of the stock of FDI to GDP for manufacturing and for service sectors, from the Eurostat database.[29]

To assess the regulatory environment within each country, we employ the World Bank's Doing Business[30] (DB) database. Using principal component analysis, we construct a comprehensive index of all regulatory policies, *all_DoingBusiness*. A second variable, *DB_business_startup*, indexes barriers to entry and exit, including the costs of starting a business, registering property, and closing a business. *DB_business_operations* indexes the difficulty of operating a firm, including securing construction permits, paying taxes, trading across borders, and employing workers. Finally, *DB_institutional_environment* is an index of the quality of the legal and institutional framework for enterprises, including the level of protection for minority shareholders, the quality of the credit information systems, and the cost and speed of contract enforcement. All indices are coded such that higher values indicate better regulation.[31] When analyzing the effects of business regulation on firm performance based on the Amadeus panel of incumbent firms, the last two principal components analysis indices—on business operations and institutional environment—are used. For these companies that managed to survive over the period, entry and exit regulation tend to matter less.

Summary statistics for all variables are provided in Appendix XI.

3. Methodology

We use the following specification to analyze productivity growth in Europe.

$$\begin{aligned}\Delta ln(Prod_i)_{03\text{-}08} = \alpha + \beta_2 ln(Prod_i)_{03} + \beta_2 Age_{i,03} + \beta_3 Size_{i,03} + \beta_4 OwnType_{i,03} + \beta_5 \Delta(InwFDI)^{j}_{03-08} \\ + \beta_6 \Delta(OutFDI)^{j}_{03-08} + \beta_7 \Delta(Credit)^{j}_{03-08} + \beta_8 \Delta(Skills)^{j}_{03-08} + \beta_9 \Delta(Bus.Reg)^{j}_{03-08} \\ + \beta_{10} \Delta(Infra)^{j}_{03-08} + \sum_m \varphi\, Sector_m + \sum_j \gamma\, Country_j + \epsilon_i,\end{aligned} \qquad \text{Eq. (1)}$$

The variable $\Delta ln(Prod_i)_{03\text{-}08}$ is the annualized growth rate of labor productivity (defined as value-added per employee) for firm *i* from 2003 to 2008.[32]

Size, is expressed in terms of number of employees on the company's payroll. Firms are grouped into five size categories: microenterprises (10–49 employees), small firms (50–249), medium firms (250–499), large firms (500–999), and very large ones (above 1,000).

Age in years is divided into categories of 1–5 years old, 6–10, 11–20, 21–30, and older than 31. Learning and selection effects imply that younger firms will grow more quickly[33].

[29] FDI stocks are the value of FDI assets (for outward FDI stocks) and of FDI liabilities (for inward FDI stocks) at the end of the reference period. Data are expressed as percentage of GDP to remove the effect of differences in the size of the economies of the reporting countries.

[30] World Bank. *Doing Business*. http://doingbusiness.org/.

[31] The PCA is built on the basis of the Doing Business indicators and as such shares the indicators' methodological limitations. To verify the robustness of the indices, we compare the PCA results with an alternative measure of the quality of business regulation, the Product Market Regulation indicator from OECD. See Appendix IV for a detailed discussion of the PCA methodology and the results of the comparison.

[32] $\Delta ln(Prod)_{i,03\text{-}08}$ is calculated as $\left[ln(Prod_{i,08}) - ln(Prod_{i,03})\right] / (2008 - 2003)$.

[33] Various studies have shown that conditional on size and survival rate, young firms tend to grow faster than older firms due to diminishing returns to learning. See Klepper and Thompson, 2007; Dunne, Roberts and Samuelson, 1989.

Ownership type, measuring the impact of FDI at firm level, is operationalized as a categorical variable denoting whether the firm is a *global headquarters* with foreign subsidiaries[34], a *foreign-affiliated* firm[35], or a *purely domestic* firm.[36] The coefficients on ownership categories capture the effects of foreign affiliation. Specifically, the coefficient on *foreign* captures the productivity benefits that a foreign-owned firm realizes from intra-organizational transfers and integration in global markets. The coefficient on *global headquarters* captures benefits to firms from investing abroad to expand their consumer base and increase efficiency. We expect that global headquarters will grow most quickly, followed by foreign-affiliates. Purely domestic firms will have the slowest growth.

$\Delta(\text{InwFDI})^{j}_{03-08}$ measures the change in the inward stock of FDI in country *j*. This indicator measures the indirect impact of the aggregate FDI flows into the country and should be analyzed in combination with the direct impact of foreign investments at firm level, measured by the ownership type.

$\Delta(\text{OutFDI})^{j}_{03-08}$ measures the same for outward stock of FDI.

$\Delta(\text{Credit})^{j}_{03-08}$ measures changes in the ratio of the credit to the private sector as a percentage of GDP. This indicator measures the (indirect) impact of the availability of credit to the private sector on an individual firm.[37]

$\Delta(\text{Skills})^{j}_{03-08}$ measures changes in the percentage of the workforce with a tertiary education, i.e. the impact on an individual firms arising from the potential availability of an educated workforce to tap into.

$\Delta(\text{Bus.Reg})^{j}_{03-08}$ measures changes in business regulation. We predict that better regulations will be positively correlated with more rapid productivity growth.

$\Delta(\text{Infra})^{j}_{03-08}$ measures variation in the index of quality of infrastructure.

The log of productivity in 2003 is included to control for initial firm characteristics: firms that begin with higher productivity levels may realize slower growth rates.[38] We include country and sector fixed-effects, which account for unobserved country- and industry-specific characteristics that might affect productivity growth.

$Sector_m$ is a vector of sector dummy variables defined at the NACE 1.1 level, while $Country_j$ is a vector of country dummy variables.

Estimations are produced using ordinary least squares (OLS), and errors are clustered by country to allow for possible correlations in growth rates across firms in the same country.

[34] Due to an idiosyncrasy of the Bureau van Dijk, co-national affiliates of headquarters firms with foreign subsidiaries are also listed as global headquarters.

[35] Foreign-owned firms are classified as those which have at least 51 percent foreign ownership. For 34 percent of firms classified as foreign affiliated by Bureau van Dijk, we cannot identify the exact ownership stake. However, as they are mostly small firms, we assume they are not publicly traded firms in which the parent's ownership could be diluted and are therefore managerially fully in control of the foreign parent.

[36] Given that the sample excludes all firms that were involved in merger and acquisitions operations, the ownership structure of a firm observed in 2009 is assumed to be the same as in 2003. We follow Brown and Earle (2002) in using the latest ownership status to create ownership dummies for 2003. However, it is worth noting that we are not able to control for cases in which the firm ownership structure has changed due to a joint venture.

[37] However, it does not measure credit constraints at firm level: even though credit might be highly available in the economy, credit allocation could not be optimal and most productive firms might face credit constrains.

[38] The inclusion of this variable may reflect convergence as proposed by Barro and Sala-i-Martin (1992). We expect the coefficient of baseline productivity level to be negative.

Regressions are run separately for EU15, EU12, and other countries as a way to better search for the sources explaining the differences between the two regions. [39] Besides, in order to also explore the sector heterogeneity—mainly related to different technologies used—we also separate the regressions by manufacturing and services, which highlight the drivers of productivity growth in different sectors of the real economy. The model also includes sector dummies to distinguish between firms belonging to different NACE 1.1 categories.[40] Results are then presented separately for EU12 and EU15 as well as for manufacturing and services industries.

Extreme outliers[41] were excluded to obtain the final samples. Regressions are performed for Sample 1 while Sample 2 is used as a robustness check (results are found in Appendices VI–IX).

4. Results

In this section, we present separately the results of the analysis for the EU12 and EU15 countries. A separate section is dedicated to the interpretation of the results for EU15 South.

4.1 EU12: a "catching up" story

The first question to answer is which category of determinants—country or firm—matters most in explaining productivity growth in the EU12. For these less developed economies, country factors matter most. The exclusion of firm characteristics from the regression for manufacturing sectors reduces the explanatory power of the model by 8 percent. However, when country dummies are excluded, the model loses roughly four times as much predictive power (33 percent). The detailed results are presented in Table 2.[42]

An additional counterfactual exercise could be used to further determine the interaction between firm- and country-characteristics. By comparing how the estimated country dummies change when adding each one of the firm variables in the model, one could verify the impact of each of the factors (baseline productivity, sector, ownership, size, and age) in explaining cross country differences. For example, if the model includes only country dummies, the average productivity gap between a Czech and a Slovenian manufacturing firm is 6.6 percent. Upon adding baseline productivity, this gap falls to 4.7 percent. Adding sector dummies does not change the result (4.6 percent). When including the ownership and size controls, the gap falls to 3.8 percent, indicating that the Czech Republic has an adverse mix of firm characteristics. The residual difference is country specific. [43]

[39] The separations observed in the kernel densities presented in Appendix I suggest that the performance of firms is in fact different in these two regions.
[40] Construction is excluded from the analysis given its cyclical nature (Burns and Grebler, 1982).
[41] A three-step procedure was implemented to control for extreme outliers. First, firms involved in merger and acquisitions operations were excluded from analysis: growth via merger is outside the scope of this paper. Second, companies whose annual productivity growth was more than three standard deviations away from the mean in each country were excluded. Third, in order to control for extreme outliers in terms of employment, we adopted criteria conditioned on firm size. For firms with fewer than 50 employees, we dropped observations for which the annual change in employment in any year was greater than 300 percent. For firms with more than 50 employees, we dropped those observations with an annual change greater than 50 percent. We also dropped observations for which the annual growth rate in any year exceeded 1000 percent.
[42] For service sectors, a similar pattern emerges since the explanatory power of the model falls more when dropping country-fixed effects (23 percent) than when excluding firm characteristics variables (8 percent).
[43] For a discussion of results from Sample 2, see Appendix V.1.

Table 2 - Decomposition of Explanatory Power: EU12 (Sample 1)

	Manufacturing			Services (except construction)		
	All controls	no country	no firm/sector	All	no country	no firm/sector
ln_lp2_usd05_03	-0.1237***	-0.0899***	-0.1167***	-0.1122***	-0.0869***	-0.1053***
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Size(50-249) [1]	-0.0156**	-0.0119*		-0.0130***	-0.0100**	
	(0.007)	(0.007)		(0.004)	(0.005)	
Size(250-499) [1]	-0.0530***	-0.0438***		-0.0269***	-0.0204**	
	(0.012)	(0.013)		(0.009)	(0.010)	
Size(500-999) [1]	-0.0229	-0.0286		-0.014	-0.0152	
	(0.019)	(0.019)		(0.015)	(0.015)	
Size(1000+)	-0.0582**	-0.0731***		-0.0217	-0.0233	
	(0.029)	(0.027)		(0.032)	(0.031)	
Age(6-10)	-0.001	0.0074		0.0013	0.0054	
	(0.009)	(0.010)		(0.005)	(0.006)	
Age(11-20)	-0.0027	0.0153		-0.0017	0.0091	
	(0.009)	(0.009)		(0.005)	(0.006)	
Age(21-30)	0.0102	0.0452**		-0.0132	0.019	
	(0.021)	(0.021)		(0.018)	(0.017)	
Age(>=31)	0.0079	0.0249		-0.0036	0.0032	
	(0.018)	(0.017)		(0.010)	(0.010)	
Global Head.	0.0670**	0.1019***		0.0309*	0.0547***	
	(0.033)	(0.036)		(0.018)	(0.018)	
Czech Rep.[4]	0.0384***		0.0466***	0.0344***		0.0475***
	(0.010)		(0.009)	(0.007)		(0.007)
Estonia	-0.0371**		-0.0280*	-0.0384***		-0.0258***
	(0.017)		(0.015)	(0.010)		(0.009)
Poland	-0.0209***		-0.0237***	-0.0152***		-0.0110**
	(0.008)		(0.007)	(0.005)		(0.005)
Romania	-0.1437***		-0.1488***	-0.1114***		-0.1054***
	(0.010)		(0.009)	(0.007)		(0.007)
_cons	1.2183***	0.8398***	1.1768***	1.0991***	0.8168***	1.0681***
	(0.049)	(0.044)	(0.049)	(0.029)	(0.025)	(0.028)
NACE dummies	Yes	Yes	No	Yes	Yes	No
R-squared	0.2185	0.1462	0.2002	0.2007	0.1544	0.1839
N. obs	3925	3925	3925	5,927	5,927	5,927

[1] (10-49) is the omitted size category. [2] (1-5) is the omitted age category. [3] Purely domestic is the omitted ownership category.
[4] Slovenia is the omitted country. Significance: *** 1%, ** 5%, * 10%.

Table 3 presents the estimation results for Eq. (1) for the EU12. Columns (1) and (7) show the results of the model (for manufacturing and services separately) when a comprehensive PCA indicator of all Doing Business variables is included. The remaining columns present the results using the PCA index measuring the difficulties associated with operating and maintaining a business (DB_Business_operations) and the (associated) original variables of paying taxes, trading across borders, employing workers, and obtaining construction permits.

Which country-specific factor correlates best with growth? Productivity gains are correlated with increases in the availability of credit to the private sector, larger stock of inward FDI, improvements in the workforce education and in the quality of business environment. The answer is similar for manufacturing and services, with some minor differences: as expected, the magnitude of the impact of FDI inflows and credit availability is larger in capital intensive manufacturing. It is worth analyzing the impact of business environment factors in manufacturing and services respectively. While the overall quality of the business environment is impacting productivity growth in both sectors, the magnitude of the impact is most relevant for services, which are also most sensitive to all indicators. A one standard deviation increase in the overall business regulation index is conditionally correlated with a 6.35 percent increase in productivity growth for the average manufacturing firm and 7.93 percent for the average service firm. A one standard deviation improvement in the tax regulations index is correlated with 4.77 percent and 7.10 percent increases in labor productivity for manufacturing and service firms, respectively.

Table 3. Firm-level Productivity Growth and Country-level time varying business indicators in the EU12

	Manufacturing						Services (except construction)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln(prod)2003	-0.1237***	-0.1237***	-0.1237***	-0.1237***	-0.1237***	-0.1237***	-0.1122***	-0.1122***	-0.1122***	-0.1122***	-0.1122***	-0.1122***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Size(50-249) [1]	-0.0156**	-0.0156**	-0.0156**	-0.0156**	-0.0156**	-0.0156**	-0.0130***	-0.0130***	-0.0130***	-0.0130***	-0.0130***	-0.0130***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Size(250-499) [1]	-0.0530***	-0.0530***	-0.0530***	-0.0530***	-0.0530***	-0.0530***	-0.0269***	-0.0269***	-0.0269***	-0.0269***	-0.0269***	-0.0269***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Size(500-999) [1]	-0.0229	-0.0229	-0.0229	-0.0229	-0.0229	-0.0229	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Size(1000+) [1]	-0.0582**	-0.0582**	-0.0582**	-0.0582**	-0.0582**	-0.0582**	-0.0217	-0.0217	-0.0217	-0.0217	-0.0217	-0.0217
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Age(6-10) [2]	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age(11-20) [2]	-0.0027	-0.0027	-0.0027	-0.0027	-0.0027	-0.0027	-0.0017	-0.0017	-0.0017	-0.0017	-0.0017	-0.0017
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age(21-30) [2]	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	-0.0132	-0.0132	-0.0132	-0.0132	-0.0132	-0.0132
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Age(>=31) [2]	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	-0.0036	-0.0036	-0.0036	-0.0036	-0.0036	-0.0036
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Global Head. [3]	0.0670**	0.0670**	0.0670**	0.0670**	0.0670**	0.0670**	0.0309*	0.0309*	0.0309*	0.0309*	0.0309*	0.0309*
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Foreign aff. [3]	0.0298***	0.0298***	0.0298***	0.0298***	0.0298***	0.0298***	0.0276***	0.0276***	0.0276***	0.0276***	0.0276***	0.0276***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$\Delta(\text{InwardFDI})_{03-08}$ [4]	0.0199***	0.0166***	0.0167***	0.0165***	0.0157***	0.0182***	0.0062***	0.0032***	0.0039***	0.0091***	0.0037***	0.0012***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.000)
$\Delta(\text{credit})_{03-08}$	0.0017***	0.0017***	0.0018***	0.0018***	0.00167**	0.0019***	0.0011***	0.0005***	0.0006***	0.0012***	0.0007***	0.0004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta(\text{Skills})_{03-08}$	0.0123***	0.0128**	0.0139***	0.0164**	0.0118**	0.0146*	0.0139***	0.0121***	0.0133***	0.0106	0.0136***	0.0125***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)
$\Delta(\text{All\_DoingBusiness})_{03-08}$	0.010***						0.012***					
	(0.000)						(0.002)					
$\Delta(\text{DB\_Business\_operations})_{03-08}$.		0.0051***						0.0095***				
		(0.000)						(0.001)				
$\Delta(\text{DB\_Permits})_{03-08}$			-0.031						-0.0341***			
			(0.004)						(0.004)			
$\Delta(\text{DB\_PayingTaxes})_{03-08}$				0.014***						0.0206***		
				(0.000)						(0.004)		
$\Delta(\text{DB\_Trading\_across borders})_{03-08}$					0.006						0.0068***	
					(0.004)						(0.001)	
$\Delta(\text{DB\_Employing\_workers})_{03-08}$						0.0039***						0.0045***
						(0.000)						(0.001)
_cons	1.4740***	1.4601***	1.5082***	1.5064***	1.4581***	1.5367***	0.5355***	0.7963***	1.4579***	1.6703***	0.6826***	1.2818***
	(0.064)	(0.071)	(0.062)	(0.061)	(0.072)	(0.077)	(0.093)	(0.066)	(0.047)	(0.065)	(0.077)	(0.040)
NACE dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.2185	0.2185	0.2185	0.2185	0.2185	0.2185	0.2007	0.2007	0.2007	0.2007	0.2007	0.2007
N. obs	3925	3925	3925	3925	3925	3925	5927	5927	5927	5927	5927	5927

[1] (10-49) is the omitted size category. [2] (1-5) is the omitted age category. [3] Purely domestic is the omitted ownership category. [4] $\Delta(\text{InwardFDI})_{03-08}$ is related to the stock of inward FDI (in manufacturing and services sectors)..*Note*: Infrastructure and stock of outward FDI variables were excluded due to multicollinearity. All PCA indices of business regulation were included in the regression. However, only All_DoingBusiness and DB_Business_Operations were statistically significant. Significance: *** 1%, ** 5%, * 10%.

Although country specific determinants appear to matter most, firm specific determinants are relevant as well. Two firm characteristics appear to be positively associated with productivity growth in EU12: ownership and size. Ceteris paribus, foreign affiliated firms' productivity grows 2.9 percent more quickly than purely domestic firms in manufacturing and 2.7 percent more quickly in services, while the difference is even more striking for "Global headquarters firms", whose productivity is 6.7 percent higher than purely domestic firms (in manufacturing and 3.1 percent in services). The combination of the importance of foreign ownership and the positive effect of inward FDI on productivity growth suggests a prominent role for FDI in the emerging European economies. Indeed, Eastern Europe has received large volumes of FDI since the 2004 EU expansion. Theory and experience indicate that openness to foreign investment helped these economies generate employment, upgrade technology, and improve managerial knowledge to accelerate productivity growth. In this regard, business regulations play an important role in attracting FDI, even after controlling for market size and factor endowments (Wagle, 2010; Demekas et al., 2007).
A second factor is size: almost 15 years since the beginning of the transition, small firms still retain a productivity advantage vis-à-vis larger ones: this is valid in both manufacturing and services. In particular the productivity of companies below 50 employees grows faster than larger competitors.

4.2 EU15 Results

A similar analysis to that one performed for EU12 countries shows that among the more developed EU15 nations, firm-level characteristics matter more than country-level variables. The exclusion of country dummies from the regression on manufacturing firms reduces the explanatory power of the model by 19 percent; for the service firms, the model loses 11 percent. Running the regression without firm characteristics reduces its explanatory power by 25 percent in both manufacturing and service. The detailed results are presented in Table 4.

Country-level variables remain a factor: locating in one country or another can net productivity gains of up to 7 percent for manufacturing firms and 5 percent for services firms. However, country performances differ widely across sectors: Norway realized the greatest productivity growth in services but also the least growth in manufacturing.[44]

Table 5 presents the EU15 estimation results for Eq. (1). Ownership and size are important correlates of productivity growth in the EU15 region.[45] As expected, Global headquarters firms grow more quickly than purely domestic firms: 2.3 percentage points more quickly in manufacturing industries and 2.9 percentage points in service industries. Foreign-owned firms also perform better than their purely domestic counterparts: 1.8 percent better in manufacturing and 2.4 percent in services. Unlike in the EU12, size does matter in the EU15: medium to large enterprises (between 50 and 500 employees) grow faster than their smaller competitors, but also than their larger ones: this "size advantage" is 1.5 percent in manufacturing, and 1.2 percent in services. Interestingly, age appears to be relevant: older firms in services grow more quickly than the younger firms; in manufacturing however, age is not statistically significant.

[44] For a discussion of results from Sample 2, see Appendix V.2.
[45] For a second method of evaluating the relative impact of firm-level variables, see Appendix X.

Table 4 - Decomposition of Explanatory Power: EU15 (Sample 1)

	Manufacturing			Services (except construction)		
	All	**no country**	**no firm/sector**	**All**	**no country**	**no firm/sector**
Ln(Prod)2003	-0.0896***	-0.0815***	-0.0796***	-0.0850***	-0.0772***	-0.0743***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Size(50-249) [1]	0.0059**	0.0039		0.0057***	0.0042**	
	(0.003)	(0.003)		(0.002)	(0.002)	
Size(250-499) [1]	0.0148*	0.008		0.0118*	0.0087	
	(0.008)	(0.008)		(0.006)	(0.006)	
Size(500-999) [1]	-0.0046	-0.0124		-0.0081	-0.0126*	
	(0.013)	(0.013)		(0.008)	(0.008)	
Size(1000+) [1]	0.0037	0.0038		0.0256*	0.0256*	
	(0.013)	(0.013)		(0.015)	(0.015)	
Age(6-10) [2]	-0.0018	-0.0053		-0.003	-0.0057***	
	(0.003)	(0.003)		(0.002)	(0.002)	
Age(11-20) [2]	0.0021	-0.0007		0.0016	0.0004	
	(0.003)	(0.003)		(0.002)	(0.002)	
Age(21-30) [2]	0.0031	0.0057*		0.0049**	0.0074***	
	(0.003)	(0.003)		(0.002)	(0.002)	
Age(>=31) [2]	0.0046	0.0104***		0.0065***	0.0085***	
	(0.003)	(0.003)		(0.002)	(0.002)	
Global Head. [3]	0.0228***	0.0260***		0.0287***	0.0285***	
	(0.005)	(0.005)		(0.004)	(0.004)	
Foreign aff. [3]	0.0185***	0.0225***		0.0236***	0.0236***	
	(0.004)	(0.003)		(0.002)	(0.002)	
Belgium	-0.0001		-0.0077	0.0091*		0.0031
	(0.007)		(0.007)	(0.005)		(0.005)
Spain	-0.0630***		-0.0728***	-0.0302***		-0.0414***
	(0.005)		(0.005)	(0.004)		(0.004)
France	-0.0224***		-0.0236***	-0.006		-0.0067*
	(0.005)		(0.005)	(0.004)		(0.004)
Italy	-0.0167***		-0.0291***	0.0089**		-0.0035
	(0.005)		(0.005)	(0.004)		(0.004)
Norway	-0.0723***		-0.0857***	0.0161***		0.0022
	(0.009)		(0.009)	(0.005)		(0.005)
Sweden	-0.0306***		-0.0319***	-0.0074		-0.0113**
	(0.007)		(0.007)	(0.006)		(0.006)
_cons	1.0112***	0.8907***	0.9162***	0.9349***	0.8441***	0.8331***
	(0.048)	(0.045)	(0.047)	(0.033)	(0.031)	(0.031)
NACE dummies	Yes	Yes	No	Yes	Yes	No
R-squared	0.136	0.1105	0.1052	0.1115	0.0995	0.0851
N. obs	16,800	16,800	16,800	28,400	28,400	28,400

[1] (10-49) is the omitted size category; [2] (1-5) is the omitted age category; [3] Purely domestic is the omitted ownership category. Finland is the omitted country. Significance: *** 1%, ** 5%, * 10%.

Country specific factors, although of lesser impact, matter as well. The quality of business regulations is the common factor driving productivity growth in both manufacturing and services. Improving business regulations produces gains in labor productivity growth, both in manufacturing and in services. A one standard deviation increase in the overall business regulation index leads to a 3.4 percent productivity increase for the average manufacturing firm and a 1.7 percent increase for the average service firm. A one standard deviation increase in the tax index correlates to a 3 percent increase in manufacturing and 2 percent in services. A one standard deviation increase of the trade index leads to 3.16 and 2.10 percent increases for manufacturing firms and service firms, respectively. A one standard deviation increase in the employment regulation index raises labor productivity by 1.52 in manufacturing and 1.42 percent in services.[46]

[46] Results for the second sample are similar in sign and magnitude; See Appendix VIII.

Table 5. Firm-level Productivity Growth and Country-level time varying business indicators in the EU15

	Manufacturing						Services (except construction)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln(Prod)2003	-0.0904***	-0.0904***	-0.0904***	-0.0904***	-0.0904***	-0.0895***	-0.0850***	-0.0850***	-0.0850***	-0.0850***	-0.0850***	-0.0850***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Size(50-249) [1]	0.0053*	0.0053*	0.0054*	0.0053*	0.0053*	0.0060**	0.0057***	0.0057***	0.0057***	0.0057***	0.0057***	0.0057***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size(250-499) [1]	0.0149*	0.0149*	0.0149*	0.0149*	0.0149*	0.0148*	0.0118*	0.0118*	0.0118*	0.0118*	0.0118*	0.0118*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Size(500-999) [1]	-0.0051	-0.0051	-0.0049	-0.005	-0.005	-0.0047	-0.0081	-0.0081	-0.0081	-0.0081	-0.0081	-0.0081
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Size(1000+) [1]	0.0035	0.0035	0.0036	0.0036	0.0036	0.0036	0.0256*	0.0256*	0.0256*	0.0256*	0.0256*	0.0256*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Age(6-10)[2]	-0.0012	-0.0011	-0.0013	-0.0012	-0.0012	-0.0017	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age(11-20)[2]	0.002	0.002	0.002	0.002	0.002	0.0022	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age(21-30)[2]	0.0054	0.0054	0.005	0.0053	0.0052	0.003	0.0049**	0.0049**	0.0049**	0.0049**	0.0049**	0.0049**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age(>=31)[2]	0.0053	0.0053	0.0058*	0.0055*	0.0057*	0.0042	0.0065***	0.0065***	0.0065***	0.0065***	0.0065***	0.0065***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Global Head.[3]	0.0213***	0.0213***	0.0216***	0.0214***	0.0215***	0.0228***	0.0287***	0.0287***	0.0287***	0.0287***	0.0287***	0.0287***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Foreign aff.[3]	0.0175***	0.0175***	0.0179***	0.0176***	0.0177***	0.0184***	0.0236***	0.0236***	0.0236***	0.0236***	0.0236***	0.0236***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$\Delta(\text{InwardFDI})_{03-08}$ [4]	-0.0152***	-0.0148***	-0.0196***	-0.0145***	-0.0182***	-0.0213***	-0.0022**	-0.0023**	-0.0023**	-0.0024*	-0.0023**	-0.0022**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\Delta(\text{OutwardFDI})_{03-08}$ [4]	0.005***	0.008***	0.007***	0.005***	0.008***	0.0024***	0.003	0.001	0.003	0.003	0.002	0.001
	(0.001)	(0.000)	(0.000)	(0.00)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)
$\Delta(\text{credit})_{03-08}$	-0.0004**	-0.0004**	-0.0008**	-0.0005**	-0.0011**	-0.0006**	-0.0005***	-0.0005***	-0.0005***	-0.0005***	-0.0005***	-0.0005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta(\text{Skills})_{03-08}$	0.0015***	0.0010***	0.0013***	0.0004*	0.0013***	0.0025***	0.0011	0.0011	0.0010	0.0009	0.0011	0.0008
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta(\text{All\_DoingBusiness})_{03-08}$	0.0052***						0.003**					
	(0.000)						(0.000)					
$\Delta(\text{DB\_Business\_operations})_{03-08}$.		0.0041***						0.002**				
		(0.000)						(0.000)				
$\Delta(\text{DB\_Permits})_{03-08}$			-0.0163***						-0.0024			
			(0.002)						(0.009)			
$\Delta(\text{DB\_PayingTaxes})_{03-08}$				0.0192***						0.0129**		
				(0.001)						(0.000)		
$\Delta(\text{DB\_Trading\_across borders})_{03-08}$					0.0030***						0.002**	
					(0.000)						(0.000)	
$\Delta(\text{DB\_Employing\_workers})_{03-08}$						0.0031***						0.0029**
						(0.000)						(0.000)
_cons	1.0152***	1.0143***	1.0137***	1.0149***	1.0134***	0.9790***	0.9571***	0.9570***	0.9566***	0.9569***	0.9567***	0.9576***
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
NACE dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.1318	0.1318	0.1327	0.1321	0.1324	0.136	0.1115	0.1115	0.1115	0.1115	0.1115	0.1115
N. obs	16,800	16,800	16,800	16,800	16,800	16,800	28,360	28,360	28,360	28,360	28,360	28,360

[1] (10-49) is the omitted size category. [2] (1-5) is the omitted age category. [3] Purely domestic is the omitted ownership category. [4] $\Delta(\text{InwardFDI})_{03-08}$ ($\Delta(\text{OutwardFDI})_{03-08}$) is related to the stock of inward (outward) FDI in manufacturing and services sectors.

Note: The variables for infrastructure and stock of outward FDI were excluded due to multicollinearity. All PCA indices of business regulation were included in the analysis. However, only all_DB and DB_business_operations were statistically significant. Significance: *** 1%, ** 5%, * 10%.

Two additional factors drive productivity growth in manufacturing, but are not significant in services: the skills of the workforce and FDI outflows. Foreign investments from EU15 towards Eastern Europe and other emerging economies are the "helping hand" which manufacturing firms receive from the opportunities for outsourcing to cheaper countries and in particular toward the EU12 ones.[47]

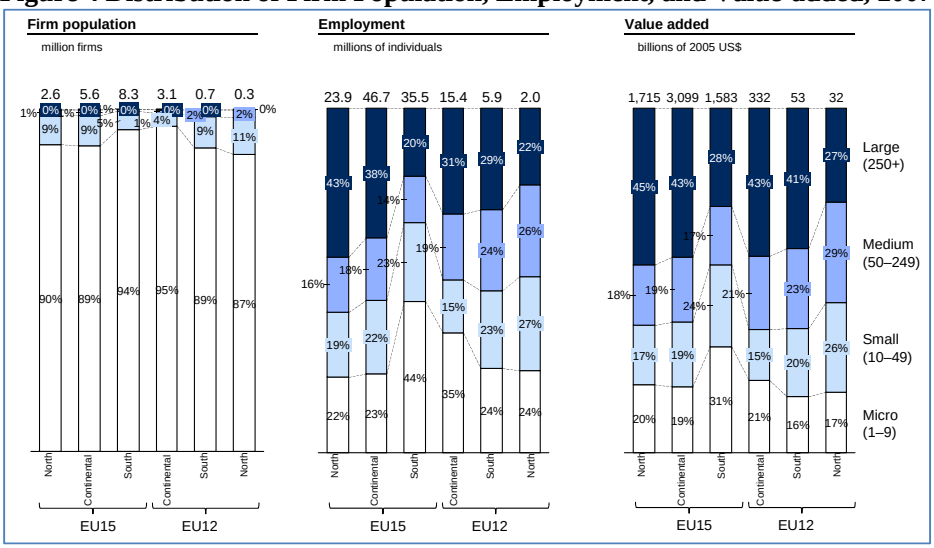
Two apparently counterintuitive results are worth commenting: the negative correlation between the country level availability of credit and the inflows of FDI and productivity growth at firm level, for both manufacturing and services in EU15. As far as credit is concerned, a few explanations can be given. During a credit expansion phase like the one ending in 2008, the allocation of credit might be skewed toward cyclical sectors, like construction, while individual firms might still face credit constraints (quote paper at ECB). The result is robust when considering the larger sample of countries for firms above 50 employees.

The negative effect of the inflows of FDI and firm level productivity is only present in sample 1. This could be explained by the fact that smaller firms are negatively affected by competition from abroad, which reduces their margins, without being compensated by the positive spillovers arising from the presence of foreign competitors, in particular in the form of technology absorption and openness to new markets. This result should be interpreted in connection with the positive productivity bias enjoyed by foreign firms.

4.3 EU15 South[48]

With the results presented above in mind, one should try to interpret the productivity contraction experienced between 2003 and 2008 by Europe southernmost countries—Greece, Italy, Portugal, and Spain.

Figure 4 Distribution of Firm Population, Employment, and Value-added, 2007



Source: World Bank staff calculations based on Eurostat.

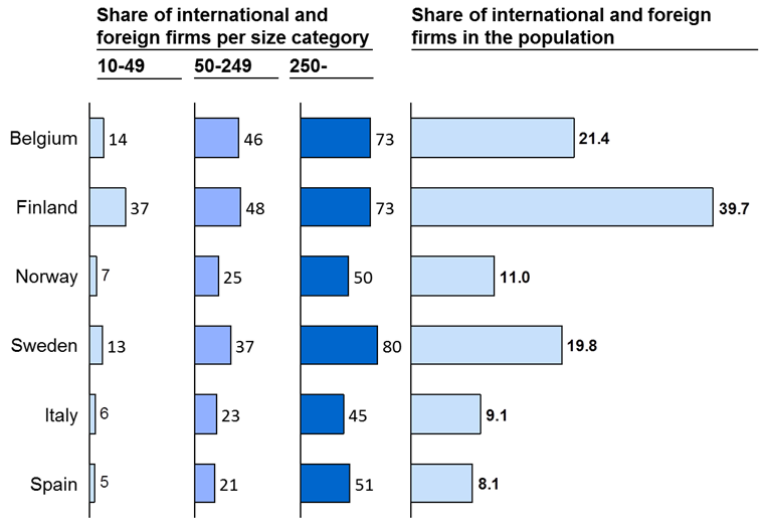
[47] See Marin (2009).

[48] The analysis of this sub set of EU15 countries uses complementary analytical tools, such as basic figures/correlations and summary statistics. As Section 4.2 already covers the whole set of EU15 countries while controlling for country-level disparities (through the inclusion of country dummies) there would be not much country structural differences if the same econometric model was ran only for Spain, Italy and Portugal (the EU15 south countries for which data is available).

The first reason lies may lie in their mix of firms. The distribution of firm size in the EU15 South is skewed towards microenterprises; very small, family-operated firms play a much greater role in the economies of Southern Europe than in the other developed economies of Western Europe. Microenterprises account for roughly one third of all value-added generated in the EU15 South and employ roughly half the workforce. When small and medium enterprises are added to microenterprises, they together employ four out of five workers in Southern Europe. These figures are nearly double those in the rest of Europe, where larger enterprises play a more significant role (Figure 4).

Second, the more limited internationalization of firms in Southern Europe also contributes to explain lower productivity growth. According to the Amadeus sample, the share of firms in Southern Europe with international connections is far lower than the rest of the EU15. This is true for all size classes, but it is compounded by the size distribution of firms in Southern Europe, skewed toward smaller enterprises and – by definition – less prone to internationalization (see Figure 5).

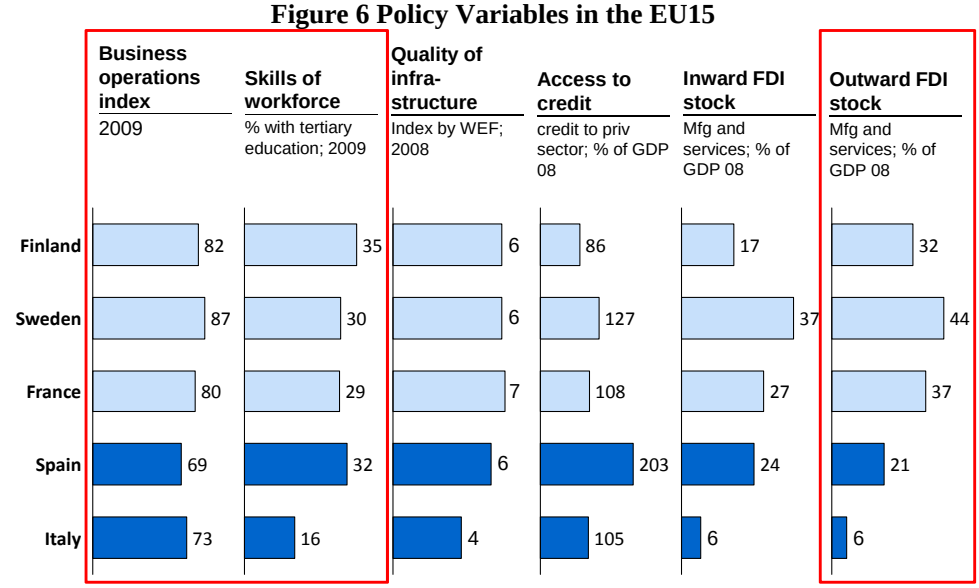
Figure 5 Internationalization of firms in Europe, 2007



Source: World Bank staff calculations based on Amadeus

Finally, EU15 South also suffers from unfavorable country characteristics (see Figure 6). In comparison to rest of the EU15, the EU15 South rated consistently lower in regulatory indices, skills of the workforce and outward FDI. These structural elements are fundamental to nurture domestic firms that invested abroad, gained access to lower costs production environments and increased demand for their outputs in foreign markets (Antras and Helpman, 2004).

Figure 6 Policy Variables in the EU15



Source: World Bank staff calculations based on *Doing Business*, World Economic Forum, World Development Indicators, Eurostat.

5. Conclusion

Using a panel of micro-data on firms from 12 EU countries[49] from 2003 to 2008, this paper addresses the confusing proliferation of suggested determinants of productivity growth and seeks to provide clear policy implications. The literature has generated theories attributing growth to country, industry, firm, and even product characteristics. Studies have thus far found support for each of these, but have failed to determine which among the many correlates are most critical for growth. We specify a model incorporating initial conditions, firm age, size, international affiliation, business environment indices, and FDI to assess the relative importance of each in explaining growth in labor productivity. We divide our sample into two groups, New Europe and Old, and obtain results for each.

In the economies of the EU12, country-level variables dominate—the most important of which are the stock of inward FDI, business regulations facilitating foreign investment, and the availability of private credit. The most important firm-level characteristic is international affiliation, either as headquarters of a multinational corporation or as subsidiary of a foreign firm. These results suggest that accession to the EU has been beneficial for new members because the ease with which foreign firms may now penetrate these new markets has facilitated the transfer of technology and the diffusion of best practices. The clear policy implication is that developing countries may realize significant productivity gains by taking the relatively easy steps of improving their regulatory regimes and creating environments attractive to inward FDI before addressing the more costly requirements of improving infrastructure and better educating their workforces.

With the EU15, firm-level characteristics dominate. Among these, the most critical are international affiliation and firm size. The most important country-level factor is outward FDI. Taken together, these results argue strongly for the role played by multinational corporations in driving productivity growth in developed countries. Thus, it is not surprising that firm size contributes to productivity growth in the EU15: as the large amount of FDI shows, firms in Western Europe are transforming themselves into headquarters of multinational corporations, and thus require more personnel to manage their global interests.

[49] For sample 2 (with firms with at least 50 employees), the sample comprises 17 countries.

However, the success of the EU15 was not shared equally by all member countries. The four southernmost nations of Greece, Italy, Portugal, and Spain suffered productivity losses. Our analysis suggests that the failure of these nations to perform may be attributed to disadvantageous and restrictive regulatory regimes, leading to a relative preponderance of small- and medium-size firms. These factors discourage international participation and sharply limit the EU15 South's ability to benefit from knowledge transfers from abroad, economies of scale, and production-reallocation efficiencies. However, these states may still achieve gains by reforming their regulatory regimes to encourage the expansion of outward FDI.

The experience of the EU15 South in relation to the rest of the EU15 raises an interesting implication for the EU12. While this paper divides Old and New Europe into two separate regions, implying at some level a fundamental difference, it may be that this difference is not necessarily intrinsic. Indeed, as Demekas et al. (2007) suggest, it may simply be the case that different characteristics matter more at different levels of economic development. The research remains to be done to find exactly at what point of development country-level attributes become less important than firm-level characteristics in predicting productivity growth, and how all these factors interact.

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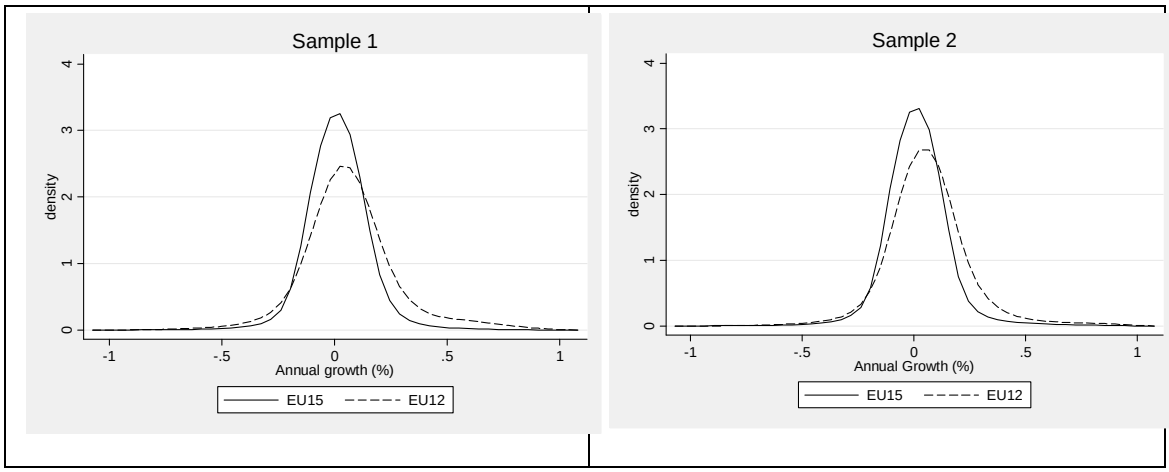
Appendix I. Nonparametric Density Estimations of Annualized Labor Productivity Growth by Region, 2003-2008



Appendix II. Annual Growth Rate at Firm Level (in %), 2003-2008

	Mean	Std. Dev	p5th	p95th
Sample 1				
EU15	1.5	14.4	-14.5	19.1
EU12	7.0	23.3	-22.2	48.2
sample2				
EU15	1.8	16.7	-14.4	19.7
EU12	6.3	19.8	-17.9	35.9

Appendix III. Re-sampling Procedure

Amadeus coverage does not necessarily reflect the underlying population distribution of firms across size classes, sectors, and countries. One reason behind this lack of representativeness is the fact that the Amadeus data only include balance-sheet information and income statements for companies above a certain size. Therefore, the data tend to be skewed in favor of medium and large firms. In addition, not all firms in the database report all critical output and input variables, reducing the number of firms for which labor productivity and total factor productivity can be estimated. This introduces a potential bias when calculating productivity figures, as the final sample may not be representative of the population distribution of firms in the country.

In order to ensure representativeness of the firm-level samples used in the paper, and align them with the distribution of the underlying firm population at the country, sector and size levels, the Amadeus dataset was re-sampled using a three step re-sampling method.

First, using population distribution figures for firms above 10 employees from the Eurostat Structural Business Statistics database for the year 2006, a sample size of 150,000 firms was designed using three stratification criteria: size (10–19, 20–49, 50–249, and 250+), sector (NACE 1.1), and country.

Second, including only firms for which at least three years of information on value added was available, random draws (without replacement) were taken for each size-sector-country stratum in the sample according to the population distribution figures. Table IV.1 presents the ratio, by country and size strata, of the targeted number of companies to the number of sampled firms.

Third, two samples were defined. Sample 1 (firms with more than 10 employees) contains countries for which the ratio between the number of sampled firms and the number of population firms was at least 80 percent per size class. Sample 2 (firms with more than 50 employees) contains countries for which the related ratio was at least 60 percent of size class.

Table IV.1 - Firm Population Versus Estimation Sample after Resampling

Country	Size class (%)				
	10-19	20-49	50-249	250+	Total
Austria	0.4	1.0	4.3	11.0	1.4
Belgium	100.0	100.3	99.8	99.4	100.0
Bosnia and Herzegovina	70.7	100.4	99.6	94.7	79.0
Bulgaria	43.0	72.6	95.0	86.9	62.0
Croatia	99.9	99.8	100.7	98.7	99.9
Czech Rep	74.1	89.4	97.6	94.1	83.2
Estonia	99.9	99.7	98.4	78.4	99.1
Finland	99.9	99.2	98.3	98.3	99.4
France	99.9	99.9	100.1	99.9	99.9
Germany	2.4	12.1	61.2	92.6	15.3
Greece*	0.0	0.0	0.0	0.0	0.0
Hungary	1.2	1.8	6.8	23.9	2.6
Ireland*	0.0	0.0	0.0	0.0	0.0
Italy	95.4	100.0	100.1	99.2	97.0
Latvia	1.2	2.4	12.3	36.1	4.0
Lithuania	0.0	0.0	0.0	0.0	0.0
FYR Macedonia	0.0	0.0	5.4	0.0	0.2
Netherlands	10.0	53.7	51.6	61.6	36.1
Norway	93.1	94.8	95.4	79.0	93.5
Poland	68.7	85.8	99.6	100.2	83.4
Portugal	57.3	62.9	90.1	98.8	63.6
Romania	99.9	99.9	99.9	96.2	99.8
Serbia	100.0	99.9	100.3	100.3	100.0
Slovak Rep	33.9	24.0	96.8	95.7	45.5
Slovenia	90.6	97.2	100.5	96.6	94.4
Spain	100.0	100.0	100.1	99.6	100.0
Sweden	99.9	100.2	99.9	98.4	99.9
Ukraine	91.9	97.2	100.0	97.0	94.0
United Kingdom	34.1	88.9	100.1	99.8	58.9

Source: World Bank staff calculations based on Amadeus and Eurostat

*For Greece and Ireland, Amadeus does not provide information on valued added.

Appendix IV. Doing Business Principal Component Analysis (PCA)

Doing Business variables cover ten topics: starting a business, dealing with construction permits, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, employing workers, and closing a business. Each of these indicators is constructed on several sub-indicators, such as procedures, time, and required cost to start a business. The variables included in this analysis are indices created using a principal component analysis (PCA) for each Doing Business topic. The PCA indices are linear combinations of Doing Business sub-indicators, where each sub-indicator is optimally weighted to maximize indicator variance. All indices are coded such that a higher number indicated more complex and inhibitive regulation on a scale of 0 to 100.

We use the PCA methodology to construct an index of all the Doing Business variables. We further create an index measuring the difficulties associated with operating and maintaining a business. Business operations includes variables for paying taxes, trading across borders, employing workers, and obtaining construction permits. Paying taxes indicates the tax burdens faced by a typical medium-sized company and includes a measure of the administrative costs of compliance. Trading across borders measures the procedural burden of exporting and importing a standardized cargo of goods by counting the number of required documents such shipment requires—from the contractual agreement between the two parties to the delivery of goods—along with the time necessary for completion. Employing workers measures difficulties in hiring, required redundancy in workers, and the rigidity of working hours. Construction permits measures the total cost of building a warehouse, including necessary licenses and permits, completing required notifications and inspections, and connecting utilities.

To verify the quality of the PCA indicator, we compare it with an alternative measure of the quality of business regulation, the Product Market Regulation indicators constructed by the Organisation for Economic Co-operation and Development (OECD 2011). Results indicate a strong correlation (0.74) between our synthetic all Doing Business variable and that of the OECD for the countries covered by both databases. The OECD indices do not comprehensively cover Europe annually, hence the construction of Doing Business indices.

Appendix V. Results for Sample 2 (firms with more than 50 employees)

V.1 EU12

When performing the exclusion exercise with the sample of surviving firms with a minimum of 50 employees, the results show a slightly different picture: country and firm characteristics are *equally* important. In fact, in the regression for manufacturing industries, excluding the country dummies reduces the explanatory power of the model by 19 percent; dropping firm characteristics variables reduces the explanatory power of the model by 15 percent. In the services industry, dropping country fixed-effects reduces the explanatory power by 13 percent while the exclusion of firm characteristics leads to a reduction of 16 percent. Country dummies also differ greatly from one another suggesting similar companies have different performance in different countries. A manufacturing firm in the Czech Republic on average grows 0.9 percentage points faster than a similar manufacturer in Slovenia.

Results from the counterfactual exercise comparing how the estimated country dummies change when adding each one of the firm variables for Sample 2 corroborate the results from Sample 1. First, firm ownership still appears as the most relevant characteristic for explaining productivity growth in the EU12. Foreign-owned firms grow faster than purely domestic ones, both in manufacturing and in services (1.2 and 2.2 percent more, respectively). Global-headquarter firms also grow more in comparison with purely domestic firms: 3.6 percent more in manufacturing and 3.9 percent in services. Again, size seems to matter less, though larger firms do grow more slowly in productivity, particularly in manufacturing. Finally, age has the opposite effect on productivity depending on the industry. In manufacturing, older firms grow more quickly: firms between 21 and 30 years old grow on average 3.4 percent more than firms less than 6 years old. In services, the opposite happens: firms older than 31 years grow on average 3.7 percent more slowly than the youngest group.

Performing the same counterfactual exercise between a Czech manufacturing firm and a Slovenian manufacturing firm again supports the previous results. The average productivity gap between a Czech and Slovenian firm with more than 50 employees in manufacturing is 2.7 percent. However, if considering two firms with the same baseline productivity, this gap falls to 1.8 percent. When limiting the observation to two firms with the same sector specialization, the gap is unaffected (1.7 percent). Finally, if the two firms share the same ownership, size, and age composition, the gap falls to 0.9 percent. The remaining effect is then country specific. Results are available upon request.

V.2 EU15

For both manufacturing and services industries, the firm-level characteristics matter most. Excluding firm characteristics from the manufacturing and services models reduces their explanatory power by 22 and 25 percent, respectively. When dropping country fixed-effects the models lose less of their explanatory power: 20 in manufacturing and 13 percent in services. See Appendix VI.

Results of the exclusion exercise from Sample 2 do not differ significantly from those of Sample 1. Again, ownership, size and age are important firm characteristics for productivity. Foreign-affiliated firms grow more quickly: 1.9 percentage points for global headquarters in manufacturing and 2.61 percentage points for services. Size is also important in Western Europe: larger firms grow more rapidly in productivity. Firms that have more than 1,000 employees experienced greater productivity growth than firms with 50 to 249 employees. Again, older firms in service sectors grow more than younger firms; in manufacturing, age is not statistically significant.

The counterfactual exercise using an Italian and a Finnish manufacturing firm shows very similar results for Sample 2. An average Finnish firm with more than 50 employees grows 2.3 percentage points more rapidly than does a similarly sized Italian firm. Regarding two firms in the same sector, the gap would fall to 2.1 percentage points. Finally, if the two firms were identical in ownership, size, and age, the gap would fall to 1.6 percentage points. The remaining effect is country specific. Country effects may cause differences in productivity growth of up to 9.6 percentage points in manufacturing and 8.4 in services. Again, country performances differ widely across sectors: Norway leads in terms of productivity growth in services, but is among the slowest-improving countries in manufacturing. See Appendix VII.

Appendix VI. Decomposition of Explanatory Power: EU15 (sample 2)

	Manufacturing			Services (except construction)		
	All	**no country**	**no firm/sector**	**All**	**no country**	**no firm/sector**
Ln(Prod)2003	-0.0943***	-0.0829***	-0.0806***	-0.0782***	-0.0703***	-0.0652***
	(0.008)	(0.008)	(0.008)	(0.007)	(0.006)	(0.006)
Size(250-499) [1]	0.0055	0.0073		-0.0021	0.0005	
	(0.006)	(0.006)		(0.004)	(0.004)	
Size(500-999) [1]	0.0096	0.0115		-0.0058	-0.0032	
	(0.008)	(0.009)		(0.006)	(0.006)	
Size(1000+)	0.0414***	0.0478***		0.0221***	0.0289***	
	(0.010)	(0.010)		(0.009)	(0.009)	
Age(6-10)	-0.0105	-0.0126		-0.0094	-0.0119**	
	(0.008)	(0.008)		(0.006)	(0.006)	
Age(11-20)	-0.004	-0.0058		0.0033	0.0008	
	(0.008)	(0.008)		(0.005)	(0.005)	
Age(21-30)	-0.0002	-0.0037		0.0023	-0.0015	
	(0.007)	(0.007)		(0.005)	(0.005)	
Age(>=31)	0.0022	-0.005		0.0116**	0.0013	
	(0.007)	(0.007)		(0.006)	(0.005)	
Global Head.	0.0199***	0.0137***		0.0261***	0.0178***	
	(0.005)	(0.005)		(0.006)	(0.005)	
Foreign aff.	0.0151***	0.0113**		0.0259***	0.0204***	
	(0.006)	(0.005)		(0.004)	(0.004)	
Belgium	-0.0101		-0.0158	-0.0046		-0.0007
	(0.011)		(0.011)	(0.010)		(0.010)
Germany	-0.0162**		-0.0154**	0.0089		0.008
	(0.007)		(0.008)	(0.009)		(0.009)
Spain	-0.0606***		-0.0660***	-0.0245***		-0.0338***
	(0.008)		(0.008)	(0.009)		(0.009)
France	-0.0262***		-0.0231***	-0.0068		-0.002
	(0.007)		(0.007)	(0.008)		(0.009)
Great Britain	-0.0595***		-0.0531***	-0.0318***		-0.0179**
	(0.009)		(0.009)	(0.009)		(0.009)
Italy	-0.0161*		-0.0240***	0.01		0.0008
	(0.008)		(0.008)	(0.009)		(0.009)
Norway	-0.0565***		-0.0730***	0.0219*		0.0073
	(0.021)		(0.020)	(0.013)		(0.012)
Portugal	-0.1067***		-0.1179***	-0.0624***		-0.0694***
	(0.012)		(0.012)	(0.010)		(0.011)
Sweden	-0.019		-0.0188	-0.0086		-0.008
	(0.014)		(0.014)	(0.013)		(0.013)
_cons	1.0821***	0.9256***	0.9342***	0.8712***	0.7821***	0.7406***
	(0.091)	(0.085)	(0.088)	(0.072)	(0.069)	(0.065)
NACE dummies	Yes	Yes	No	Yes	Yes	No
R-squared	0.1515	0.1203	0.1186	0.1127	0.0981	0.0841
N. obs	4775	4775	4775	6316	6316	6316

[1] (50–249) is the omitted size category, [2] (1–5) is the omitted age category, [3] Purely domestic is the omitted ownership category. Finland is the omitted country. Significance: *** 1%, ** 5%, * 10%.

Appendix VII. Firm-level Productivity Growth in the EU15 (Sample 2)

	Manufacturing					Services (except construction)				
	All controls (1)	Ownership + sector+ baseline prod+ country dummies (2)	Sector+ baseline prod+ country dummies (3)	Baseline prod + country dummies (4)	Only country dummies (5)	All controls (6)	Ownership + sector+ baseline prod+ country dummies (7)	Sector+ baseline prod+ country dummies (8)	Baseline prod + country dummies (9)	Only country dummies (10)
Ln(prod) 2003	-0.0943***	-0.0924***	-0.0888***	-0.0806***		-0.0782***	-0.0774***	-0.0738***	-0.0652***	
	(0.008)	(0.008)	(0.008)	(0.008)		(0.007)	(0.007)	(0.006)	(0.006)	
Size(250-499) [1]	0.0055					-0.0021				
	(0.006)					(0.004)				
Size(500-999) [1]	0.0096					-0.0058				
	(0.008)					(0.006)				
Size(1000+)	0.0414***					0.0221***				
	(0.010)					(0.009)				
Age(6-10)	-0.0105					-0.0094				
	(0.008)					(0.006)				
Age(11-20)	-0.004					0.0033				
	(0.008)					(0.005)				
Age(21-30)	-0.0002					0.0023				
	(0.007)					(0.005)				
Age(>=31)	0.0022					0.0116**				
	(0.007)					(0.006)				
Global Head.	0.0199***	0.0228***				0.0261***	0.0268***			
	(0.005)	(0.005)				(0.006)	(0.005)			
Foreign aff.	0.0151***	0.0180***				0.0259***	0.0259***			
	(0.006)	(0.005)				(0.004)	(0.004)			
Belgium	-0.0101	-0.0106	-0.0117	-0.0158	-0.0407***	-0.0046	-0.0038	-0.0037	-0.0007	-0.0265**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Germany	-0.0162**	-0.0125*	-0.0173**	-0.0154**	-0.0376***	0.0089	0.0109	0.0061	0.008	-0.0180**
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Spain	-0.0606***	-0.0604***	-0.0656***	-0.0660***	-0.0659***	-0.0245***	-0.0257***	-0.0312***	-0.0338***	-0.0262***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
France	-0.0262***	-0.0235***	-0.0237***	-0.0231***	-0.0176**	-0.0068	-0.0035	-0.0027	-0.002	-0.0085
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)
Great Britain	-0.0595***	-0.0556***	-0.0525***	-0.0531***	-0.0510***	-0.0318***	-0.0241***	-0.0179**	-0.0179**	-0.0202**
	(0.009)	(0.008)	(0.008)	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Italy	-0.0161*	-0.0152*	-0.0211***	-0.0240***	-0.0233***	0.01	0.0103	0.0045	0.0008	-0.007
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Norway	-0.0565***	-0.0590***	-0.0654***	-0.0730***	-0.1161***	0.0219*	0.0188	0.0128	0.0073	-0.0039
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.013)	(0.012)	(0.012)	(0.012)	(0.014)
Portugal	-0.1067***	-0.1046***	-0.1083***	-0.1179***	-0.0612***	-0.0624***	-0.0618***	-0.0655***	-0.0694***	-0.0403***
	(0.012)	(0.011)	(0.012)	(0.012)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
Sweden	-0.019	-0.0176	-0.0194	-0.0188	-0.0006	-0.0086	-0.0073	-0.0089	-0.008	-0.001
	(0.014)	(0.013)	(0.013)	(0.014)	(0.015)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
_cons	1.0821***	1.0596***	1.0302***	0.9342***	0.0502***	0.8712***	0.8656***	0.8381***	0.7406***	0.0349***
	(0.091)	(0.091)	(0.090)	(0.088)	(0.007)	(0.072)	(0.071)	(0.070)	(0.065)	(0.008)
NACE dummies	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
R-squared	0.1515	0.1475	0.1428	0.1186	0.0173	0.1127	0.1102	0.104	0.0841	0.0028
N. obs	4775	4775	4775	4775	4803	6316	6316	6316	6316	6391

[1] (50–249) is the omitted size category. [2] (1–5) is the omitted age category. [3] Purely domestic is the omitted ownership category. Finland is the omitted country. Significance: *** 1%, ** 5%, * 10%

Appendix VIII. Firm-level Productivity Growth and Changes in Country Characteristics in the EU15 (Sample 2)

	Manufacturing						services(except construction)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln(Prod)2003	-0.0892***	-0.0893***	-0.0908***	-0.0893***	-0.0894***	-0.0901***	-0.0775***	-0.0775***	-0.0771***	-0.0778***	-0.0775***	-0.0771***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Size(250-499) [1]	0.0038	0.0038	0.0032	0.004	0.0037	0.0037	-0.0025	-0.0025	-0.003	-0.0023	-0.0026	-0.0031
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Size(500-999) [1]	0.006	0.0059	0.0054	0.0063	0.0059	0.0062	-0.0067	-0.0068	-0.0079	-0.0061	-0.007	-0.0079
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Size(1000+) [1]	0.0375***	0.0375***	0.0359***	0.0382***	0.0373***	0.0368***	0.0207**	0.0204**	0.0195**	0.0213**	0.0202**	0.0196**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Age(6-10)[2]	-0.0112	-0.0112	-0.0115	-0.011	-0.0112	-0.0114	-0.0093	-0.0092	-0.0097	-0.0091	-0.0092	-0.0097
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age(11-20)[2]	-0.0043	-0.0041	-0.0036	-0.0041	-0.0041	-0.0045	0.0032	0.0033	0.0032	0.0033	0.0034	0.0032
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age(21-30)[2]	0.0012	0.0012	0.0022	0.001	0.0014	0.0012	0.0012	0.0015	0.0027	0.0012	0.0019	0.0028
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age(>=31)[2]	0.0032	0.0029	0.0034	0.0026	0.003	0.0039	0.0082	0.0079	0.0103*	0.0079	0.0079	0.0105*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Global Head.[3]	0.0199***	0.0197***	0.0204***	0.0194***	0.0198***	0.0211***	0.0246***	0.0244***	0.0258***	0.0243***	0.0243***	0.0258***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Foreign aff.[3]	0.0170***	0.0167***	0.0177***	0.0161***	0.0168***	0.0185***	0.0248***	0.0246***	0.0264***	0.0243***	0.0247***	0.0265***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
var0308_instock_gdp[4]	-0.0021	-0.0025	-0.0004	-0.0040*	-0.002	-0.0012	-0.0068***	-0.0059***	-0.0050***	-0.0051***	-0.0064***	-0.0055***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
var0308_outstock_gdp[4]	0.0052***	0.0055***	0.0032**	0.0063***	0.0052***	0.0032**	0.0006	0.0004	0.0017**	-0.0005	0.0008	0.0020***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
var0308_credit_gdp	-0.0007***	-0.0006***	-0.0006***	-0.0007***	-0.0007***	-0.0006***	-0.0003***	-0.0002***	-0.0002***	-0.0005***	-0.0002***	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
var0308_skills	0.0003	0.0004	0.0001	0.0010**	0.0003	0.0003	0.0001	0.0002	0.0002	0.0012***	0.0001	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
var0308_all_DB	0.0018**						0.0021***					
	(0.000)						(0.001)					
var0308_group2_DB		0.0016***						0.0015***				
		(0.000)						(0.000)				
var0308_Permit_			0.0047*						0.0013			
			(0.003)						(0.002)			
var0308_Tax_				0.0057***						0.0104***		
				(0.001)						(0.002)		
var0308_Trade_					0.0016***						0.0011***	
					(0.000)						(0.000)	
var0308_Empl						0.0015						0.0002
						(0.001)						(0.000)
_cons	1.0012***	1.0010***	1.0168***	1.0016***	1.0038***	1.0134***	0.8740***	0.8738***	0.8642***	0.8824***	0.8747***	0.8657***
	(0.090)	(0.089)	(0.087)	(0.089)	(0.089)	(0.088)	(0.072)	(0.072)	(0.073)	(0.073)	(0.072)	(0.073)
NACE dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.139	0.1394	0.1385	0.1404	0.1392	0.1381	0.1097	0.1097	0.1085	0.1108	0.1096	0.1085
N. obs	4775	4775	4775	4775	4775	4775	6,316	6,316	6,316	6,316	6,316	6,316

[1] (10–49) is the omitted size category. [2] (1–5) is the omitted age category. [3] Purely domestic is the omitted ownership category. [4] var0308_instock_gdp(var0308_outstock_gdp) is related to the stock of inward (outward) FDI in the manufacturing industry. var0308_instock_gdp(var0308_outstock_gdp) is related to the stock of inward (outward) FDI in the services industry.
Note: The variables for infrastructure and stock of outward FDI were excluded due to multicollinearity.

Appendix IX. Firm-level Productivity Growth in the EU12

	Manufacturing					Services (except construction)				
	All controls (1)	Ownership + sector+ baseline prod+ country dummies (2)	Sector+ baseline prod+ country dummies (3)	Baseline prod + country dummies (4)	Only country dummies (5)	All controls (6)	Ownership + sector+ baseline prod+ country dummies (7)	Sector+ baseline prod+ country dummies (8)	Baseline prod + country dummies (9)	Only country dummies (10)
Ln(prod) 2003	-0.1237***	-0.1242***	-0.1227***	-0.1167***		-0.1122***	-0.1120***	-0.1108***	-0.1053***	
	(0.005)	(0.005)	(0.005)	(0.005)		(0.003)	(0.003)	(0.003)	(0.003)	
Size(50-249) [1]	-0.0156**					-0.0130***				
	(0.007)					(0.004)				
Size(250-499) [1]	-0.0530***					-0.0269***				
	(0.012)					(0.009)				
Size(500-999) [1]	-0.0229					-0.014				
	(0.019)					(0.015)				
Size(1000+) [1]	-0.0582**					-0.0217				
	(0.029)					(0.032)				
Age(6-10) [2]	-0.001					0.0013				
	(0.009)					(0.005)				
Age(11-20) [2]	-0.0027					-0.0017				
	(0.009)					(0.005)				
Age(21-30) [2]	0.0102					-0.0132				
	(0.021)					(0.018)				
Age(>=31) [2]	0.0079					-0.0036				
	(0.018)					(0.010)				
Global Head[3]**.**	0.0670**	0.0589*				0.0309*	0.0253			
	(0.033)	(0.033)				(0.018)	(0.018)			
Foreign aff. [3]	0.0298***	0.0269***				0.0276***	0.0270***			
	(0.010)	(0.009)				(0.005)	(0.005)			
Czech Rep.[4]	0.0384***	0.0371***	0.0457***	0.0466***	0.0666***	0.0344***	0.0349***	0.0437***	0.0475***	0.0893***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Estonia	-0.0371**	-0.0346**	-0.0201	-0.0280*	0.0436***	-0.0384***	-0.0365***	-0.0233**	-0.0258***	0.0457***
	(0.017)	(0.017)	(0.015)	(0.015)	(0.017)	(0.010)	(0.010)	(0.009)	(0.009)	(0.011)
Poland	-0.0209***	-0.0242***	-0.0212***	-0.0237***	0.0051	-0.0152***	-0.0171***	-0.0152***	-0.0110**	0.0241***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Romania	-0.1437***	-0.1440***	-0.1408***	-0.1488***	0.0057	-0.1114***	-0.1105***	-0.1078***	-0.1054***	0.0533***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
_cons	1.2183***	1.2161***	1.2039***	1.1768***	0.0438***	1.0991***	1.0923***	1.0819***	1.0681***	0.0212***
	(0.049)	(0.048)	(0.048)	(0.049)	(0.006)	(0.029)	(0.029)	(0.028)	(0.028)	(0.005)
NACE dummies	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
R-squared	0.2185	0.2153	0.2124	0.2002	0.0128	0.2007	0.1998	0.1975	0.1839	0.0122
N. obs	3925	3925	3925	3925	3981	5,927	5,927	5,927	5,927	5,927

[1] (10-49) is the omitted size category. [2] (1-5) is the omitted age category. [3] Purely domestic is the omitted ownership category. [4] Slovenia is the omitted country.
Significance: Significance: *** 1%, ** 5%, * 10%.

Appendix X. Firm-level Productivity Growth in EU15 countries

	Manufacturing					Services (except construction)				
	All controls (1)	Ownership + sector+ baseline prod+ country dummies (2)	Sector+ baseline prod+ country dummies (3)	Baseline prod + country dummies (4)	Only country dummies (5)	All controls (6)	Ownership + sector+ baseline prod+ country dummies (7)	Sector+ baseline prod+ country dummies (8)	Baseline prod + country dummies (9)	Only country dummies (10)
Ln(prod) 2003	-0.0896***	-0.0888***	-0.0860***	-0.0796***		-0.0850***	-0.0842***	-0.0817***	-0.0743***	
	(0.004)	(0.004)	(0.004)	(0.004)		(0.003)	(0.003)	(0.003)	(0.003)	
Size(50-249) [1]	0.0059**					0.0057***				
	(0.003)					(0.002)				
Size(250-499) [1]	0.0148*					0.0118*				
	(0.008)					(0.006)				
Size(500-999) [1]	-0.0046					-0.0081				
	(0.013)					(0.008)				
Size(1000+) [1]	0.0037					0.0256*				
	(0.013)					(0.015)				
Age(6-10)[2]	-0.0018					-0.003				
	(0.003)					(0.002)				
Age(11-20)[2]	0.0021					0.0016				
	(0.003)					(0.002)				
Age(21-30)[2]	0.0031					0.0049**				
	(0.003)					(0.002)				
Age(>=31)[2]	0.0046					0.0065***				
	(0.003)					(0.002)				
Global Head.[3]	0.0228***	0.0254***				0.0287***	0.0307***			
	(0.005)	(0.005)				(0.004)	(0.004)			
Foreign aff.[3]	0.0185***	0.0203***				0.0236***	0.0245***			
	(0.004)	(0.004)				(0.002)	(0.002)			
Belgium[4]	-0.0001	0.0005	-0.003	-0.0077	-0.0297***	0.0091*	0.0096*	0.0046	0.0031	-0.0218***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Spain	-0.0630***	-0.0632***	-0.0694***	-0.0728***	-0.0532***	-0.0302***	-0.0308***	-0.0378***	-0.0414***	-0.0244***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
France	-0.0224***	-0.0213***	-0.0224***	-0.0236***	-0.0225***	-0.006	-0.0038	-0.0058	-0.0067*	-0.0157***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Italy	-0.0167***	-0.0167***	-0.0237***	-0.0291***	-0.0288***	0.0089**	0.0091**	0.0012	-0.0035	-0.0123***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Norway	-0.0723***	-0.0730***	-0.0801***	-0.0857***	-0.1222***	0.0161***	0.0149***	0.008	0.0022	0.0044
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Sweden	-0.0306***	-0.0300***	-0.0343***	-0.0319***	-0.0152**	-0.0074	-0.007	-0.0124**	-0.0113**	-0.0025
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
_cons	1.0112***	1.0049***	0.9822***	0.9162***	0.0502***	0.9349***	0.9299***	0.9116***	0.8331***	0.0308***
	(0.048)	(0.048)	(0.047)	(0.047)	(0.005)	(0.033)	(0.033)	(0.032)	(0.031)	(0.004)
NACE dummies	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
R-squared	0.136	0.1353	0.1318	0.1052	0.0181	0.1115	0.1107	0.1066	0.0851	0.0024
N. obs	16,800	16,800	16,800	16,800	16,800	28,366	28,366	28,366	28,366	28,366

[1] (10-49) is the omitted size category. [2] (1-5) is the omitted age category. [3] Purely domestic is the omitted ownership category. [4] Finland is the omitted country.
Significance: *** 1%, ** 5%, * 10%.

Appendix XI. Summary Statistics for Variation in Country Characteristics, 2003–2008

	EU15				EU12			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
FDI in stock manufacturing (% over GDP)	2.29	2.68	-0.64	4.72	1.3	1.28	-1.46	1.55
FDI out stock manufacturing(% over GDP)	2.95	3.46	-1.29	9.87	0.16	0.31	-0.87	0.47
FDI in stock services(% over GDP)	3.16	2.93	0.56	7.18	3.98	3.56	-0.10	5.91
FDI out stock services(% over GDP)	3.23	5.84	-5.23	12.81	1.58	2.05	0.06	9.22
Credit to private sector(% over GDP)	40.19	31.69	7.63	89.51	27.52	8.4	20.97	46.72
Skills (% of workforce with tertiary education)	2.14	5.37	-22.90	5.20	3.01	1.45	0.30	4.60
All DB indicators*	4.38	6.48	-2.06	16.11	6.76	6.15	1.24	15.06
DB_Business Operations*	4.67	8.44	-1.04	6.37	5.54	8.43	2.03	9.47
Dealing with Construction Permits*	0.4	0.77	0.00	1.62	0.35	1.39	-2.02	2.69
Paying Taxes*	1.45	1.54	-1.97	3.95	1.36	3.33	-0.71	7.77
Trading Across Borders*	4.92	10.38	-2.36	23.97	6.42	10.61	-2.71	20.94
Employing Workers*	2.08	4.86	-7.36	8.92	0.65	3.87	-7.20	4.82

*All indicators were constructed through a PCA based on Doing Business (DB) data. All indicators were coded such that higher values indicate simpler regulation.